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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXV. No. 3173.] LONDON, MARCH 5, 1924. [76TH YEAR. PRICE 1s.

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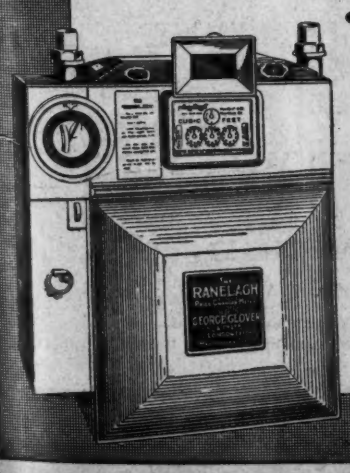

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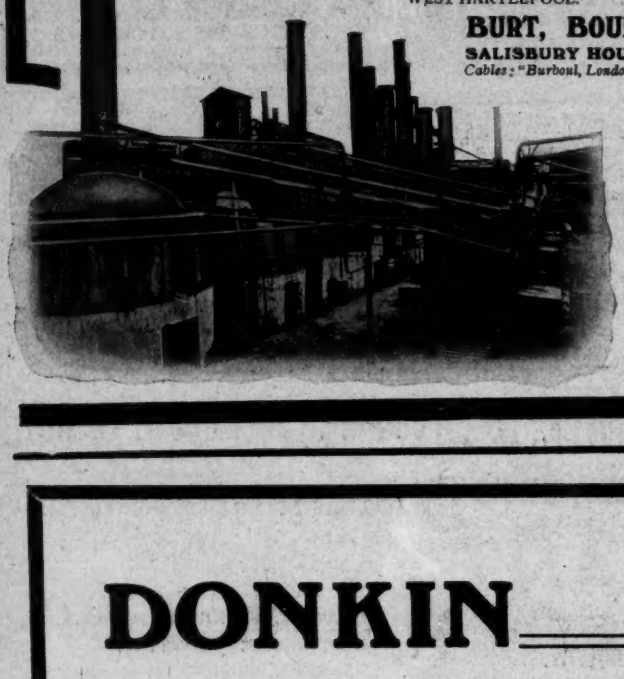

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VOL. CLXV., No. 3173.] WEDNESDAY, MARCH 5, 1924. [76TH YEAR.

EDITORIAL NOTES.

British Empire Gas Exhibit Preparations.

THERE is considerable enthusiasm among the members of the Committee who have in hand the work of organizing the Gas Exhibit for the industry at the British Empire Exhibition. As an article in later columns relates, the buildings and pipework are in an advanced state; and they will form an excellent framework for the objects which they are designed to serve. There has been orderly formulation of plans from the very beginning, so that the Committee knew exactly what they wanted on behalf of the industry, and what they intended to get—given the means. They kept well in the forefront of their considerations and deliberations over the details of the display those things which would give the most effective result. Thus it is that the plans are developing along the road to materialization with a precision which attests good foresight; and we are confident that with the issue of it all there will be universal gratification in the industry. Exhibitions to-day are not required which show goods or appliances in the mass. The art of effective demonstration by typical appliances is what has to be studied. The object-lesson is more valuable and lastingly impressive than a bulk display of the same things in several sizes. To show how an appliance can be used efficiently, to illustrate how it looks in an appropriate setting, do more good than a range of a hundred similar appliances standing cold and uninviting. Such demonstrations are uninteresting and unimpressive; and they convey no definite message. The demonstration with life in it develops interest and knowledge. That is what the Committee are working for; and to achieve which they are spending money for the industry.

Speaking of money reminds that the flow of contribution has been excellent so far; but the total sum required is still short by several thousand pounds to satisfy the estimates for the complete scheme. We want to impress this upon readers: The Gas Exhibit at Wembley does not constitute the entire project. It is, of course, the cardinal, and therefore the most money-absorbing, feature; but the organizing machinery is already steadily at work on that part of the scheme which is to advertise it far and wide. There is preliminary work to be done among the public—continually during the run of the exhibition—before they visit Wembley. They have to be impressed with the fact of the existence of the Gas Exhibit Section; and by having it brought repeatedly to notice, they will make a special point of including it in their itinerary of the great show. The electricity industry is freely ascribing to its commodity a superiority over gas applications which is not true. The public have of late had much of this, though, fortunately, they are not easily misled in these matters. And the persistent invitation that they will have from the gas industry to "Come and see for yourselves at the British Empire Exhibition" will assure them that the industry has something to show of which it is proud, and which for economy, efficiency, and practical utility has not yet been beaten, and there are no indications that it will be. Thus it is seen that there is work to be done outside the exhibition—far and near. This, too, will cost money. It will be money well spent.

Rather under 400 gas undertakings have so far subscribed, and generously. There are about 400 more statutory concerns which have not subscribed. It is from them that it is hoped the necessary balance of money will be forthcoming. There is no fear that it will not be. There is a big belief in a new spirit and a larger outlook throughout the industry than formerly obtained. But what is wanted is that the money shall now come in quickly. The time is short (merely a few weeks) before the opening of the exhibition; and the Committee are naturally anxious to keep within the limits of available funds. But they do not want to have the scheme fall short of the maximum possible advantage to the industry by the absence of the additional few thousand pounds —something like one-third of the total already received— that are needed for the effective carrying out of the full plans. The gas industry of this country leads in the combined service of light, heat, and power. That position is a proud one. It must be maintained in the British Empire Exhibition.

Development of the Thermal Yield in Carbonization.

THE second of the illuminating Cantor Lectures by Mr. E. V. Evans was delivered at the Royal Society of Arts last Monday. Those who are technically concerned in coal carbonization and who heard the lecture (as will those who read it in our pages) must have come to the conclusion as the lecturer proceeded that, much as they thought they knew about the subject, their knowledge falls far short of what there is to be learned by competent and thorough investigation. Of this we are confident, that these contributions to the science of coal carbonization will stand out prominently in the literature of the subject, and that in distant times the work and the thought and conclusions embodied in the lectures will be quoted by technologists whose interests lie in the same direction. These lectures are presenting new ideas and facts, and widely opening up fresh avenues for work; for there will be men who will desire to confirm many of the points made by Mr. Evans. In the first lecture (published in the "JOURNAL" last week), he developed the point that to determine alone the gaseous thermal yield in the carbonizing process does not inform us as to the desirable and economic distribution in the products—gas, tar, and coke—of the therms in the coal used. In the second lecture, the close relationship existing between gas and tar is treated. This is a subject that in the past has not received sufficient attention by the gas industry. Much of the work that has been published is described by the lecturer as entirely misleading, as it has been carried out by investigators who have failed to appreciate the thermal inter-relation between the three products derived from the carbonization of coal. The lecturer carries us far into matters relating to this thermal inter-relation; but we will leave the lessons for emphasis in an article in a succeeding issue.

Critical Days.

THE coal owners and miners will resume their negotiations to-morrow in their search for a new wages agreement; and there will generally be sincere hope that a mutually satisfactory basis for one will be found before the expiration, on April 17, of the existing agreement. It is impossible to make any intelligent forecast as to what will happen, in view of the obviously determined attitude of the miners to get more out of the industry in the form of pay, ostensibly for the purpose of levelling-up the wages of the poorer paid men, and, admittedly, there are such in the industry. But the miners will not look economic facts squarely in the face; they always turn their backs on them. If they would examine them with due discrimination, they would have to admit that their idea of making the consumer pay extra is likely to do untold harm to the industry upon which they

depend. They would also find that the wages now being paid in the industry are equal to 80 p.ct. above those per ton of coal raised in 1914. This is readily appreciated when it is learned that during the period of the agreement the wages have averaged 11s. 3d. per ton of coal raised, as compared with 6s. 3d. in 1914, which is an increase of about 80 p.ct., and so is well above the increased cost of living. The fact suggests that there is something wrong with the distribution of the huge sum paid annually in wages if the men in every grade are not getting their pre-war rate, *plus* the increase in the cost of living. The miners have not definitely made up their minds as to the terms of an agreement which would satisfy them to replace the one they are abandoning (and which the owners tried to preserve, or at any rate the principles of it); but a delegate conference has been summoned for March 12 to decide the important point. They will have some difficulty, for Communist representatives are bringing forward proposals in excess of the ideas of the Executive of the Miners' Federation. It is foreshadowed that one thing the delegates are certain to demand is a minimum wage equivalent to the earnings of 1914 (more tons of coal were then raised than now), *plus* the increase in the cost of living. The miners themselves agree, according to the statements of their leaders, that, if this demand is satisfied, there will have to be an increase in the price of coal.

The statisticians of the coal industry tell us that, even if the owners' profits during the period of the agreement—October, 1921, to October, 1923—had been totally absorbed for paying wages at the rate now proposed on behalf of the men, they would have been inadequate. The profits during that period amounted to 33 millions. If during those years wages equal to the 1914 earnings, *plus* the additional cost of living, had been paid, the wages bill would have been increased by 42½ millions; so that the owners' profits would have been short by 9¼ millions of the extra wages demands. Mines cannot be run indefinitely without any profit; and the miners are not so foolish as to think they can be. They know there must be capital in industry and trade. But their leaders talk quite lightly—as though it would be the simplest thing in the world, and do no injury to the industry—of 3s. per ton being clapped on to pithead prices to meet their requirements. Of course, they cannot, or will not, see this would be madness. It would mean a great loss of export trade, which in present circumstances the country cannot afford to lose. America is now getting a big footing in our overseas coal markets. The higher cost, too, would also have a seriously detrimental effect upon the country's industries. But this does not appear to be a matter that in any way disturbs the peace of mind of the miners, or rather of their leaders. Their business does not extend beyond gaining their wages ends; the effects of what they seek are for other people to consider—not them.

This is regrettable; and, in our opinion, it is also a pity that, while the negotiations are pending for a new agreement, the Bill should have been introduced into Parliament, and is about due for second reading, which is known as the Miners' Minimum Wages Bill, and which is intended to provide for what we have already pointed out is impracticable without a rise in the price of coal—that is, a minimum wage equal to the 1914 earnings, *plus* the increased cost of living. The regulation of wages by Act of Parliament is something that must be resisted; there must not be any arbitrary interference with the economic laws governing British industry, if it is to hold its own in the markets of the world. Parliament has very seriously to choose between doing something prejudicial to our economic status, or refusing to gratify the desires in this respect of men who apparently do not appreciate the harm they are proposing to inflict on the country. There can be no inflexible regulation of wages. The wages an industry can afford to pay are those which will maintain it in a state of prosperity. Anything which depreciates the power of such maintenance attacks also the power of giving employment. But people who cannot see beyond their noses fail to appreciate this.

We have before us the views of a chemical manufacturer on the evil effects which high coal costs have upon the industrial position of the country, and, we may add, upon the general cost of living. He specially cites the gas industry, seeing that its very existence depends on coal. The community largely relies upon it for light, heat, and power, and so do the industries generally; the chemical, textile, and other industries also depend upon it for supplying products derived from the carbonization of coal. A rise of 3s. per ton would (as we have before pointed out) mean to the gas industry an increased burden of approximately £3,000,000; and all of their customers for the primary or the secondary products would have to share the burden. Our chemical manufacturing friend acknowledges that, since the termination of the war, gas undertakings have made energetic efforts to reduce the prices of gas to figures that are well on the road to pre-war ones. Even now gas prices are something like 50 p.ct. above those of pre-war days; but the coal from which the gas is made is about 100 p.ct. more. The energetic attempts to which our chemical friend refers were partly prompted by a recognition by gas undertakings that, if trade and industry were generally to recover, it was imperative that the selling price of this necessary should be reduced as speedily as possible. In the case of sliding-scale companies, there was the additional incentive of a higher dividend as the price of gas was reduced.

There is appreciation of the signal success of the endeavours of gas undertakings; but this appreciation by one who is able to measure these things by knowledge of them is not general among the public, as is attested by the fits of protest found from time to time in those newspapers which are always on the *qui vive* for something with which to attack somebody. The public pay, without protest, much more for other commodities than they do for gas in comparison with pre-war rates; yet they grumble over the cost of gas. The protest comes more from the ordinary consumers than from the pay-as-you-go prepayment consumers. The secret of this is the accumulated total of the quarterly account. However, the chemical manufacturer says that naturally gas undertakings cannot but regard with misgiving any circumstance which is calculated not only to arrest the progressive reduction of gas prices, but which will involve an advance in them. Of course, it is not generally realized that a number of industries are served with materials essential to their lives through the treatment of coal by the gas industry, and that any increase in the cost of those essentials must be passed on to the users of the products of those industries. Both the heavy and the fine chemical industries would particularly suffer from any increase in the cost of coal; and they are the subjects at the present time of very acute competition from abroad. These are indeed critical days.

Taxation and Industry.

Heavy taxation in this country is having a serious effect upon trade, through the burden upon industry, and the lowering of the spending power of the people. Not only does ponderous taxation increase the production and selling costs of commodities, but home buyers have through the same cause less money to spare for buying them. In other words, with less money to spend, they have to pay more for goods, and so there is a restriction of trade. Any reduction, therefore, which can be made in the volume of either direct or indirect taxation would produce very large benefits for the country. Taxation in this country is at an appalling height. The Chancellor of the Exchequer (Mr. Snowden), in a written reply to a question in Parliament, gives some startling comparative figures of taxation per head of the population in some of the leading countries of the world. The United Kingdom stands at the head with £15 18s. The figure for France is only £6 18s. 2d.; United States (Federal), £6 14s. 10d.; Italy, £3 6s. 11d.; Germany (Reich), £4 1s. 4d.; Canada, £7 19s. 8d.; Australia (Commonwealth), £8 1s. 9d. and (States) £3 4s. 2d.; South Africa (Union), £3 9s. 11d. and (Provinces) 11s. 9d.; and New Zealand, £12 5s. 3d. Mr. Snowden says that international comparisons of this nature require to be used with great caution, owing to the differing national wealth, financial systems, and social and economic structures of the countries compared. There may be these differences. But there are the facts that our taxation has a supremacy in comparison with other countries; that it is a burden and a drag upon the prosperity of the country, and upon the ability of our industries to compete with those of other countries; and that it is partly responsible for the high cost of living and the reduced spending power of the people. It is further pointed out by Mr. Snowden that the figures for the United States, Germany, and Canada show the taxation to cover the expenditure only of the Central Government, and do not include the expenditure of the States for which information is not available.

This question of heavy taxation is one that has particular concern for a Labour Government; for it strikes at the

very root of the great problem of unemployment. The more relief industry can obtain from financial burdens of the kind inflicted by taxation, the greater its power to develop trade, and therefore employment. The two things are inseparable, just as loss of trade must and does bring about a reduction of employment. There is a mass of unemployment now, and every year sees increases in population, and the number of employable persons. Thus it is that this question of heavy taxation, which impedes industry and the spending power of the individual, or the saving power to provide capital, is one of great importance to any Government—a Labour Government especially. There have been indications that there will be a substantial surplus on the 1923-24 Budget; but it may be that there will through various causes be losses in the coming year. But if an improvement of trade could be secured, this would do much to offset those losses. In addition, the country looks to the Government to effect economies by a rigid restriction of national and local expenditure. Considerations such as these have led the Federation of British Industries to address a memorandum to the Chancellor of the Exchequer, in which they urge that immediate attention should be directed to the giving of relief from taxation, in order to stimulate industry and employment. If any reduction can be made, there is no question that it should be by a lowering of direct taxation, as this would be the most quickly responsive in beneficial results for industry. It would have the effect of reducing the costs of production, and would leave a larger surplus of national income over national expenditure from which savings could be made to provide capital for fresh developments. Moreover, while the symptoms of a revival of trade are appearing, a reduction of direct taxation would encourage enterprise and initiative.

The suggestions of the Federation of British Industries first propose the total abolition of the Corporation Profits Tax. It is an inequitable tax, and has been acknowledged to be such by successive Chancellors of the Exchequer. This should be followed by relief in regard to super-tax upon funds placed to reserve by private firms. In this connection there is one difficulty, and that is, while ensuring freedom from super-tax for money legitimately placed to reserve, to prevent the concession being used improperly to evade taxation by individuals. The Federation next urge a reduction of income-tax this year, even if only a small one. There is no question that this would be most valuable upon the broad grounds already indicated. As to super-tax, this merits consideration as it falls upon that class of income from which the largest savings are made for reinvestment purposes. Though this point is made by the Federation, they say that they would not press it except in the special circumstances of the times.

The further suggestion is offered—this has been made before by the Federation—that a thorough and careful investigation should be undertaken by a Royal Commission into, firstly, the whole question of the incidence of taxation, central and local, and its effects upon trade and industry; and, secondly, into the possibility of simplifying and codifying the present taxation system so as to enable the ordinary business concern to prepare its returns with a minimum of trouble and expense, and the Revenue Authorities to collect taxation as easily and inexpensively as possible. Until a careful and exhaustive investigation has taken place, it would be in the highest degree dangerous—so little being known as to the real incidence of taxation, and as to its reactions upon industry—to attempt any drastic changes. We think that with this most people will agree.

Meeting of the Institution.

Although the meeting of the Institution is more than three months distant, members are strongly advised not to leave their hotel bookings to the eleventh hour. We understand that the hotels are already heavily engaged ahead owing to the expected big influx of visitors to the British Empire Exhibition.

Expenses of Members.

Members of the Institution who are officials of local authorities will be interested in a letter the Secretary (Mr. Walter T. Dunn) received from the Ministry of Health, dated the 21st ult. This states that the Minister will be prepared to consider an application from any local authority whose accounts are subject to Government audit, and who own a gas-works undertaking, for sanction to the payment of the reasonable expenses of two delegates (of whom one should be the gas engineer) in attending the annual meeting.

Adventitious Custom.

The accommodation for visitors to London will be strained to the utmost this summer in view of the British Empire Exhibition at Wembley. Therefore, enterprising people are investing in empty houses, and converting them into boarding establishments. They require gas-cookers and gas-fires; and this adventitious work is making gas-fitting staffs extraordinarily busy. The year should therefore be a good one for gas consumption in the metropolitan area.

Appliances Sold and on Hire.

Last week some figures were given as to remarkable suburban increases in gas appliances sold or hired in 1923. The Tottenham District Light, Heat, and Power Company, we find, topped the lot. Their increase in appliances sold and let on hire amounted to 12,065. One factor which makes these figures rather remarkable is that approximately 70 p.ct. of the consumers take their gas through slot meters. This gives some indication as to the nature of the district.

Household Coals.

Prices of household coal from Nottinghamshire were raised in London last Saturday by 2s. to 4s. per ton; 2s. was also put on to the prices at the Staffordshire and Warwickshire pits. The coal merchants have been busy saying uncharitable things about gas; but their policy is doing gas no harm. We cannot say it is due to that policy, but it is significant that, during their propaganda in favour of their own commodity and against gas, gas-fires and other gas-heated appliances have had quite a boom.

Chemists and Dyestuffs.

The chemists of the country appear to view with great alarm a proposed working agreement between the British Dyestuffs Corporation and the Interessen Gemimschaft; and, through the British Association of Chemists, a protest has been made to the President of the Board of Trade (the Right Hon. Sidney Webb) against the ratification of the scheme. The chemists feel that the future of the organic chemical industry in this country will be seriously prejudiced if the terms of the proposed agreement are correct as published; and if the Corporation become the agents here for the German concern, it is feared that this must have a disastrous effect upon the British industry, and would reverse completely the policy of the Government with regard to the building-up of the industry, which is one of the first lines of defence in peace and war. The dyestuffs industry is described as the only training ground for technological chemists. There may be in some quarters an objection to that description. It is urged that the industry is not merely concerned with the manufacture of dyestuffs, but it is at the basis of the whole organic chemical industry, with its innumerable products applied to the service of the community in the most diverse spheres. Of course, one sympathizes with the chemists in this matter; but there are other interests to be considered. This was a view that evidently possessed Mr. Webb, for while he sympathized with the chemists, and appreciated the labours of scientific workers, it was clear that he failed to visualize the possibility of scientific men being placed in dominant control of the whole administrative machine. However, no definite agreement has yet been submitted to the Board of Trade; and any such scheme would have to be ratified by the shareholders of the Corporation, and will require the approval of the Government. Before approval is given, there will be full consideration of the interests of all parties concerned.

Gas-Meter Testing Stations.

As we have previously mentioned, the question of the adequacy and situation of gas-meter testing-stations in this country is receiving the attention of the National Gas Council. Apparently there is some question as to whether the existing ones are sufficient in number or conveniently situated enough to meet the reasonable requirements of all gas undertakings of the country. If this proves not to be the case (as will be disclosed by a short questionnaire which has been circulated by the Central Executive Board), then consideration will have to be given to the steps

that should be taken to secure the establishment of additional stations. The great distance to which some undertakings have to send their meters means an inordinate expense, and there is the risk of damage to the instruments themselves. Regarding the law relating to this matter, the Sale of Gas Act, 1859, and the amending Act of 1860, which authorized the establishment of meter-testing stations, are very involved pieces of legislation. They enabled a borough to establish a station, provided that the Acts were adopted within the period of time prescribed—that is to say, before April 13, 1861. After the expiration of that period, the power could not be exercised. The result is that those boroughs which did not adopt the Acts within the prescribed time, and those boroughs which have come into existence since, have no powers whatever in this respect. Moreover, any borough (other than a county borough) which adopted the Act, but whose population in 1881 was less than 10,000, has, under the Local Government Act, 1888, forfeited the power to establish a testing-station, and has become merged with the county for the purposes of the Sale of Gas Act. The only authority, therefore, which at the present time can establish a new gas-meter testing station is a county council; and this authority can make the Act operative throughout the county, including the area of the boroughs which did not adopt the Sale of Gas Act before the prescribed date. As a matter of practice, such action has not generally been taken by county councils other than counties of a city or of a town. The Royal Commission on Local Government, which is at present sitting, has heard evidence on the matter; and it has been strongly suggested that the whole law relating to it should be amended.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Fort Dunlop.

At the invitation of the Directors of the Dunlop Rubber Company, Ltd., over seventy members of the Association visited on Saturday last, March 1, the extensive works at Fort Dunlop.

Mr. A. Armishaw (Deputy Chief Engineer) received the members, who, in parties conducted by Messrs. Armishaw, Baird, and Kelland, spent a very interesting and instructive afternoon in inspecting the following departments and shops: Solid tyre department; tube department; band shop; washing, mixing, and drying department; tyre shops; spreading department; golf ball department; machine tool shop; new stores and offices; test department; and power house.

Afterwards they were entertained at tea in the Staff Canteen, at the close of which the President (Mr. L. H. Thomas) moved a vote of thanks to the Directors and staff of the Dunlop Company for their kindness, and said that the members had been struck by the immense extent of the works, the efficient lay-out and high standard of maintenance, and the care exercised in every operation, from which one could understand the reputation which the firm held throughout the world. The Vice-President (Mr. J. H. Gee) seconded. Mr. Armishaw replied.

PERSONAL.

Mr. George Clarry's retirement, after 40 years as Secretary and 15 years as General Manager of the Cardiff Gas Light and Coke Company, has been honoured by two presentations on the eve of his removal to Bournemouth. The first of these was made by the united staffs of the Company, Mr. H. D. Madden, Manager and Secretary, asking Mr. Clarry to accept an album containing the signatures of all employed by the Company, and Mrs. Clarry a handsome clock. In making the presentation Mr. Madden referred to its unique character. He did not know of a similar previous occasion in which every section of the employees of the Company had united in contributing to a joint presentation to a retiring Chief. When Mr. Clarry came as Secretary 40 years ago, the undertaking was comparatively a small one. In the period the output of gas had grown sevenfold. The policy pursued by Mr. Clarry was always a progressive one, and invariably he had warmly supported him (the speaker) in the installation of new machinery and the modernizing of the plant. Mr. Clarry earned the gratitude and admiration of all grades for the institution of the admirable co-partnership and pension schemes. Mr. R. J. Auckland (Secretary) said Mr. Clarry had always thought first how he could improve the condition of the Company's employees, and had been described by the Chairman of the Company (Mr. C. E. Dovey, J.P.) as "the champion of the working men of the Company." Mr. Clarry said others were entitled to some of the praise which had been given him. The employees had done a great deal to ensure the progress of the Company; and without their loyal co-operation it would have been impossible to reach the state of perfection they had attained. When he got to Bournemouth, he would never forget his old happy associations with the Company and his staff; and he would always remember that particular day of pleasant leave-taking. In acknowledging her gift, Mrs. Clarry said how pleased she was to see the way in which her husband was appreciated by his old colleagues. Mr. Clarry's public services as a member of the Cardiff Education Committee and as Vice-Chairman of the Technical Instruction Committee were recognized by the presentation of an illuminated address and his photograph from the members of the Committee and the College staff. Sir William Diamond said no one had a warmer place in the hearts of the people of Cardiff than Mr. Clarry. Principal Chas. Coles remarked that they would never forget the facilities given by Mr. Clarry, in the provision of a shed at the gas-works, for the training of munition workers. Mr. Clarry had also presented them with the gas-engine which drove all the machinery at the Technical College. In acknowledgment Mr. Clarry referred to the great work of the College in training the boys and girls of Cardiff to be good citizens.

Mr. James Paterson, M.A., is relinquishing his appointment of Engineer and General Manager to the Cheltenham Gas Light and Coke Company. Mr. Paterson was appointed in January, 1914, to succeed his father, the late Mr. R. O. Paterson. He was previously Engineer to the Redhill Gas Company, which appointment he took up in 1903.

The Blackburn Corporation General Purposes Committee have approved a proposal for an increase in the salary of Mr. G. P. Mitchell, the Gas Engineer, from £900 to £1000 per annum.

Mr. S. A. Wikner, Manager of the St. Anthony's Bye-Product Works of the Newcastle-upon-Tyne and Gateshead Gas Company, has been elected a Fellow of the Institute of Chemistry.

OBITUARY.

It is with regret that we have to record the death at Tenby Mansions, W., on the 26th ult., from heart failure, of Mr. Edwin Charles Bode, of Westcliff-on-Sea, Secretary of the Continental Union Gas Company, Ltd. Deceased, who was in his 62nd year, had been connected with the Company for the past 48 years, for some time as Accountant, then Assistant Secretary, and afterwards as Secretary, which post he held at the time of his death.

We are sorry to learn of the death on Feb. 8, at the age of 71, of Mr. William D. Hunter, who had been Engineer of the Rotherhithe Works of the South Metropolitan Gas Company since 1899, prior to which he was at the Vauxhall Works. He had been for over fifty years in the service of the Company, of which he was a most able and zealous officer, enjoying the friendship and esteem of all his colleagues, and the affectionate loyalty of those who served under him. The funeral in Nunhead Cemetery was attended by hundreds of the co-partners of the Company, a large number being men who had served under the deceased at Rotherhithe.

ELECTRICITY SUPPLY MEMORANDA.

There has been previous comment on the singular method which some local authorities possessing electricity concerns have of "improving" their street lighting at enormous expense by laying down electric cables for the purpose, and installing costly electric lamp-post equipment, while it is well known that modern gas-lamps can be installed at a small part of the expenditure, and give superior good effect. This is public administration with uneconomy and inefficiency; and it is a gross waste of the money of the ratepayers. We were talking over this matter the other day with a man who knows something of a district in which there have been fairly frequent failures of the electricity supply. In his opinion street lighting by electricity is a good advertisement for gas, as not only is the lighting in the area in which he resides inferior to that which previously obtained (possibly through the units being of meagre candle-power, in order to produce false economy), but the failures of the street lighting have been informative to people who are not users of electricity for domestic purposes, and so have had a good result in favour of gas. From another source, we learn that repeated failures have made a gas company very busy in the work of installing shop lamps, where electricity was formerly the lighting agent.

The Advertising Power of Failures.

Among the notes we have recently made of electrical failures and fires is one reported in the "Daily Mail" in connection with a concert at the Wigmore Hall London, W., on the afternoon of Tuesday of last week. It seems that, in the middle of the concert, the electric light failed; but what our morning contemporary regards as very wonderful is that Mr. Percival Garratt performed the feat of playing the accompaniments of Brahm's "May Night" and "Sapphic Ode" in the dark. Then there was a long interval while a hunt for candles was instituted. By their glimmering light—which excused the sketchiness of the accompaniments in three arias from "Figaro"—the rest of the concert was achieved. There was a cessation

Reliability of Electricity.

of supply at Woolwich last Saturday night, owing to temporary trouble at the generating station. Another breakdown recorded is one due to a defect at the Corwen Electricity Works, when—this was on the 18th ult.—the supply of electricity was prominent by its absence the whole day. Hotels, shops, the library, and public hall, were illuminated by candles and paraffin lamps. Much inconvenience was, of course, caused in the hotels where (the report before us says) the cooking is done by electricity. It was certainly "done" in another sense by electricity on this particular day. Recently reporting from Madrid a disastrous fire at the Academy of Military Engineers at Guadalajara, a "Daily Telegraph" correspondent stated that it occasioned a loss amounting to about £500,000. The correspondent, towards the end of his report, expresses the view that the fire was caused by a short circuit. We wonder why our electrical contemporaries have not yet said rude things regarding the Madrid correspondent of the "Daily Telegraph."

Products, Ducts, and a "Super" Fan.

Mr. L. L. Robinson, the Borough Electrical Engineer of Hackney, has written a letter to the "Electrical Times," from which it appears he has been doing a little spying work in the buildings that have been erected at the British Empire Exhibition for the exhibit of our industry. He ought to have been above that sort of thing. He says nothing about the excellent and attractive design of those buildings; but he belittles his own reputation as an engineer by the obviously sneering character of his letter. He refers to the "preparations for the super gas show," and states that he was particularly interested in the elaborate ventilating scheme which is being prepared with carefully camouflaged air-ducts. He also noticed a beautiful fan (afterwards described by him as a "super" fan) quite big enough for providing the forced draught for a good-sized refuse destructor. We should like to ask Mr. Robinson whether he noticed another thing; and it is that, in these buildings, no provision has been made for the upward conveyance of the products of combustion from the numerous gas-fires and other heating appliances that will be demonstrated during the six months' run of the exhibition. Apparently he did not. We suppose that, as an engineer, Mr. Robinson is aware that the natural course of things for heated products of combustion is to ascend, and not to descend; and as this natural order of things is going to be reversed with an accumulation (in a relatively small space) of gas-heated appliances, the reason for the ducts and the fan for exhaust purposes is readily explained. Mr. Robinson is also particularly anxious to know whether the "super" fan will be driven by a quiet electric-motor or a noisy gas-engine. He is an "engineer;" the gas exhibit is also being run by engineers, who, instead of indulging in sneering, apply the instrument most adapted to any particular purpose. We have not inquired whether the fan will be run by an electric-motor or a gas-engine. We think it is probable it will be by the former. Mr. Robinson's engineering education must be behind the times if he thinks that modern gas-engines are noisy. Whether or not they are so, they are wonderfully economical compared with the electric motor for running a group of machines and for long-hour operation. Men who are real engineers should be catholic in their ideas and practices; they should also be observant; and they should know that abnormal conditions require abnormal treatment. When abnormal treatment is necessary, then they should be more than usually careful not to show that their professional knowledge is insufficient to guard them against indulging in the vulgarity of a misplaced sneer. Apparently, where there are no products of combustion to be carried away in a downward direction, electrically operated fans are to be used in the exhibition; for an official report, referring to the exhibition generally, says: "Electricity will be used for ventilation purposes." Then why not in the Gas Exhibit?

Meteor's Evasions.

When recently dealing with the comments of the electrical papers on Mr. D. Milne Watson's comparison of the energy supplied by the Gas Light and Coke Company and the whole of the electricity undertakings, we intended to ask for further information upon a statement by "Meteor," of the "Electrical Times," but overlooked it. It was that "any process of fuel utilization that begins with the distillation of coal is not, economically speaking, a satisfactory proposition in the end." But it would have been little use asking him, as Mr. T. Mohn has, in the columns of our contemporary, expressed the desire for further details and figures in support of the sweeping statement. But "Meteor" dismisses the awkward question by saying: "The sumptuous tournament of facts and figures to which Mr. Mohn and his friends invite us obviously could not take place in the space at our disposal." The thing that is most obvious about that statement is that the task would not be one to "Meteor's" liking. It would not take up much space for him to show the principal data upon which he founded his assertion. He shelters himself behind the lines provided by German power-station fuel experts. What is wrong with "Meteor's" statement is that he should have qualified it; but he preferred to make a categorical assertion, and there leave it for acceptance—and if anybody asked him for the meaning, well, space will not permit! The manufacture of gas and other products from coal can be described as "a process of fuel utilization that begins with distillation of coal." From that process coke results; and several power-station engineers could tell "Meteor" that coke used under their boilers is, "economically speaking, a satisfactory proposition." If he studies the matter, he will find that some of the lowest generating costs are to be found at stations using this product of coal distillation. It might not be an economical proposition if an electric power station put down a carbonizing plant on its own account. In the note to Mr. Mohn's letter, "Meteor" also says: "There has been far too much loose talk about the destructive burning of coal; it is only a catchword." It is true there has been "far too much loose talk" regarding this matter; and "Meteor" has not far to look for a sample of it. Will he explain what he means by "it is only a catchword," or, at all events, give some justification for the statement?

Water Boiling.

One of the difficulties with electrical heating of water is to obtain an economical method of supplying small quantities of hot water promptly. Mr. G. G. Bell, of Hammersmith, according to a communication made to the "Electrical Times," claims to have accomplished this. We are a little dubious as to whether he has actually achieved all he claims. It appears that his apparatus consists of four essential parts—the storage tank, a much smaller diameter extension or dome fitted to the top of the tank, a separate heating chamber underneath the tank, and connected to it by flow and return pipes, which are carried through the bottom plate of the tank up inside, finishing close to the top. The flow-pipe to the heating chamber is placed directly underneath, and concentric with, the dome. The heating chamber is fitted with heating elements, preferably of the immersion type. The fourth essential part is a cylindrical float which is normally housed in the dome, and is so constructed as to work freely up and down over the flow-pipe. When in its highest position, its lower end is just clear of the orifice of the flow-pipe. Fresh water enters from an open-topped supply cistern at the bottom of the tank; and the boiling water is drawn off by a faucet at the top of the dome. Mr. Bell gives the results of a test, which began at 8.45 and ended at 11.30—2¾ hours. During that time 18 gallons (180 lbs.) of water at 212° Fahr. were drawn; but we are told that the inlet water temperature was 70° Fahr. We wonder whence and when inlet water at such a temperature is obtained. Perhaps in some tropical country. Certainly not here during the weather we have recently been experiencing. The units used were eight, so that it is easy to calculate, with each pound of water requiring to be raised only 142°, that Mr. Bell claims for his apparatus over 90 p.ct. efficiency. But the cost of eight units for heating 18 gallons of water would be regarded as somewhat high in most dwellings. The writer of "Cooking and Heating Notes" in our contemporary makes the somewhat profound remark that "the supply of boiling water under low pressure is common practice in restaurant and catering work generally. It is entirely satisfactory." Of course it is, when performed by gas, which is the "common practice." But he wants some more information: As to heat insulation lagging; thermostatic, time switch, or other control; and as to "what would happen to a domestic installation if the householder takes his family away for a month's holiday, and forgets to switch-off."

As Others See Us.

One of the amazing things in connection with the competition between electricity and gas is that the men who are engaged in the work on behalf of the former show a large amount of ignorance as to the modern development in efficiency of gas-appliances. In a third article in our contemporary "The Electrician," in which it again beats the big drum over what it calls its "Big Development Scheme" or "National Campaign," it alludes to the paper by Mr. Hardie before the Electrical Society of Glasgow (this will be referred to later), and points out that he stated "the battle was virtually won years ago. The opposition is now practically left without ammunition or modern equipment of any kind with which to continue the battle." This shows a remarkable ignorance. Further on our contemporary states that the gas interests of this country must be amazed when they see a rival with such illimitable reserves of strength as they must recognize electricity to possess continuing to allow them to dominate the situation at most points. These expressions of view of myopic people are capped by a later statement: "There is a very large proportion of electrically lighted houses still equipped with gas-cookers and gas-stoves. Why? Because of a belief that electricity for any purpose but as an illuminant is impossibly expensive. This false idea is, of course, encouraged by gas propagandists on every conceivable occasion." Naturally, if people encourage false ideas of this kind, presuming it is a "false idea," they are assailing the truth, and therefore deserve a descriptive term which contains five letters. Now we know what our contemporary "The Electrician" thinks of the men of the gas industry.

Wills.—Mr. Alfred James Edwards, late Manager of the Taunton Gas-Works, left estate of the gross value of £5963, with net personalty £5181. Mr. Edward Waters Frost, who was Superintendent of the Aylestone Road Gas-Works, Leicester, left £11.721, with net personalty £6538.

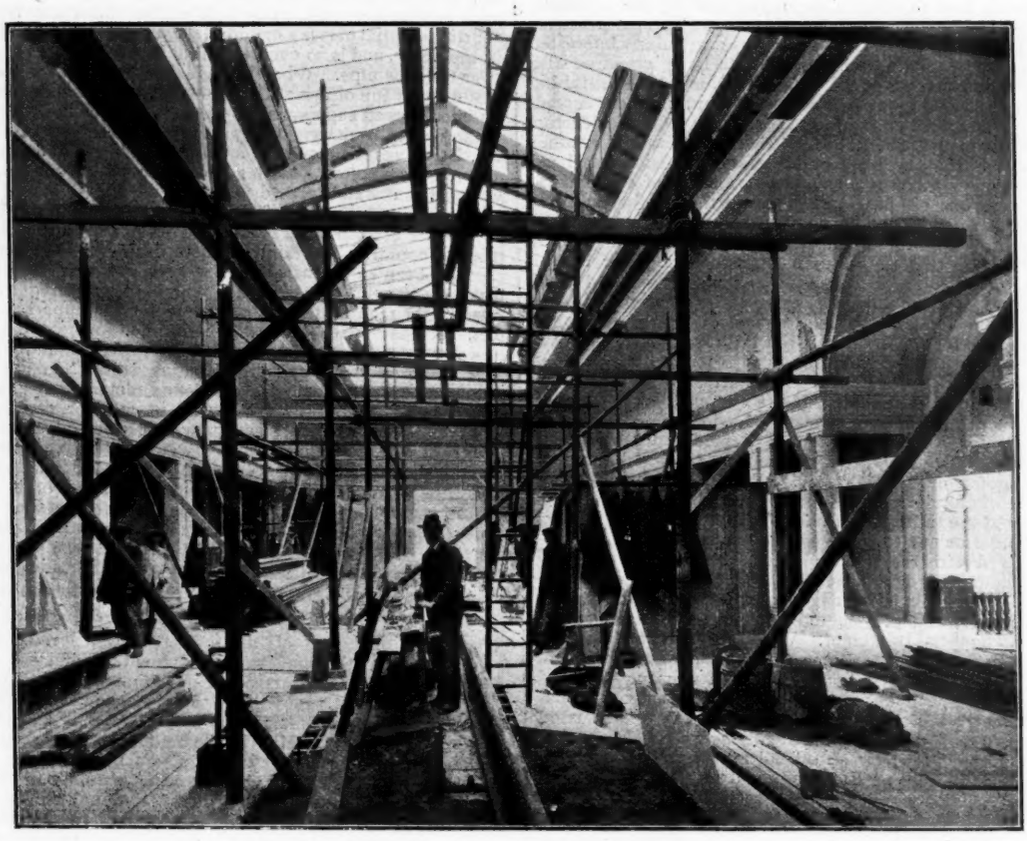
Manufacture of Neutral Sulphate of Ammonia.—In a paper on this subject read by Mr. G. Stephenson before a meeting of the Coke Oven Managers' Association on Feb. 23, the author gave particulars of a plant which produced a salt containing 25·63 p.ct. of ammonia, 0·018 p.ct. of free acid, and 0·13 p.ct. of moisture.

A PRELIMINARY VISIT TO THE GAS EXHIBIT BUILDINGS AT WEMBLEY.

TRAVELLING along the Harrow Road with a friend who had been over it many times before, the writer—a Londoner be it confessed—caught his first glimpse of the Empire Stadium at Wembley. There it sat, large and bold, upon high ground, as though keeping guard over the huge buildings which have risen on the descending ground below. As nearer approach was made, there were seen the minarets, the towers, and the domes of buildings which afterwards were to be associated with India, Malay, and other of our oriental Dependencies. And then a nearer view was obtained of the buildings through which the writer was presently to wander, and to wonder as to how it had all been accomplished in the space of time during which this remarkable presentment of architectural feats has been in course of creation.

Much has been read, and illustrations have been seen, regarding the marvels that the British Empire Exhibition is going to unfold. But all that has been read, all the pictures that have been noticed, have not stirred as did this visit the writer's imagination to a realization of an extraordinary greatness. It was all a huge surprise from beginning to end. What was expected were huge, gaunt, partially completed structures, uninteresting at this stage, in which a vast collection of the products and treasures of the Empire were to be assembled. Instead, though steel framework, concrete, and cement have entered largely into the composition of the structural work, beautiful buildings met the eye, with ornamental façades and artistic front elevations, which give evidence of the best of architectural talent having been engaged on the work of combining the merits of utility with ornate features—the whole gratifying to the eye, and appropriate to the destined purpose. We see this inside and outside the Palaces of Industry and Engineering. Outwardly the design of these Palaces is pleasing, with its straight-cut lines, and substantial appearance—symbolic of the strength and power in the world of the industries and trade of Great Britain; the towers with their minarets, and the domes of other buildings are in keeping with parts of the Empire across the seas; and there are the buildings of Canada, Australia, New Zealand, Africa, and other quarters of the world, which are all uniting in an unprecedented display of the might, wealth, and varied products of the Empire. There will be a feast of architectural beauty here for those of a profession in which the gas industry is deeply interested. It is all an unpremeditated vision, in surroundings which will contain much that will demonstrate the great property and potentialities of the Empire and the history of its rise to its present status—and this by both material and spectacular presentation, a huge part of which, however, is altogether outside the scope of our pages.

The buildings are now receiving their external finishing touches. The grounds are passing from a condition of mud and muddle, due to such extensive and gigantic work proceeding everywhere simultaneously, into a more ordered state. It is all being transformed into what even now—as we view the broad arterial ways, the grass stretches between the buildings, the planting of shrubs that is proceeding—we can predict will be something fair and picturesque to look upon. There are, besides the gigantic buildings, the lakes and the bridges, the kiosks dotted here and there along the sides of the former and about the vast grounds—some 25 acres in extent; there is the Amusement Park, where things are well forward, and girl artists are deftly decorating the buildings. In an advanced condition, too, is the elevated railway, which will transport from one part of the grounds to another millions of people by endless screw, alternately of large and narrow pitch—the trains running fast and then slow. All this great transformation has required upon it some 16,000 men; and what number the whole of the work that has had to be done in making the exhibits that will very soon be transported and be handled and installed here (again giving employment to more men) is really beyond computation. The British Empire Exhibition has done something to reduce the level of unemployment, and will continue to do so; for a place so extensive, so interest imparting, as this will be will require in it many attendants, many exponents, and many workers. We could dwell long upon the impressions of this wonderful and imposing creation which is to demonstrate, to instruct, and to advertise so much, and be an object-lesson to the world in respect of the wealth of industrial power and capacity possessed by the British Empire.



[*Photo. by Campbell Gray.*

A VIEW SHOWING THE PROGRESS OF WORK IN ONE OF THE TWO LARGE HALLS FOR THE GAS EXHIBIT.

The writer, in company with others, came across Sir Lawrence Weaver, the Director of the United Kingdom Exhibits (particularly of Industry and Engineering); and Sir Lawrence knows everything about what is going on over that large acreage of grounds and buildings. His fund of interesting information appears to be of an inexhaustible character. Much as he has to do, he was not too busy temporarily to take the part of Cicero, and point out and eloquently describe the main features of the work done and in prospect. He was particularly interesting in the Palace of Arts, where there will be a great accumulation of treasures from all parts of the Empire, and inside which everything has been arranged with an eye to the efficiency of display—in the picture galleries and in the ecclesiastical hall this was markedly noticeable. And it is the same in all the buildings. Brains have been at work here to make this Exhibition never as exhibition has been before. There has been design to purpose and for effect.

GAS EXHIBIT PLANS AND SUBSCRIPTION.

We must not dwell longer on general features, however inviting. The writer had a desire to see the progress that was being made with the Gas Exhibit buildings. Having expressed the wish to do so to the energetic Chairman of the Executive Committee of the General Committee who have been entrusted by the gas industry with the organization of the exhibit, Mr. Goodenough said: "Come along then;" and we went. As we travelled, he told of some of the plans the Committee have in view; and if those plans are carried out with the fulness that the Committee desire, we have confidence, from what we have seen of the first big stage of their materialization, that the propaganda harvest for the industry will be immense and profitable. The world is going to know more of the capacity and potentialities of the gas industry through this than it has ever known before. We are assured of it. The complete carrying out of the scheme, however, is all a question of funds. A further £16,000 will make all the difference to a well-rounded success. Money has been coming in encouragingly. But less than half the statutory undertakings have as yet subscribed; and from the other moiety, there ought to be no difficulty in securing £16,000—more if possible.

GAS EXHIBIT BUILDINGS.

We are in the Palace of Industry—in the main avenue which leads to the Conference Halls. How many hundreds of thousands of men and women will pass this way during the six months following the opening of the Exhibition in April! And how many from here, there, and everywhere will be attracted to the Palace of Industry by the enormous collection of products from all parts of Great Britain! As we stand looking down the broad main avenue, an entrance way to a section stands out boldly. That, said someone admiringly, is the entrance to the Gas Exhibit. The writer passed into the buildings. Having been and seen them, he can say they are a credit to the industry, to the Gas Exhibition Committee, to the architect (Mr. H. Austen Hall, F.R.I.B.A.), and to the contractors (Messrs. Osborne & Co.), who, by the way, have employed on the construction work all ex-service men. They only started operations at the beginning of January; and in seven weeks they have made such progress that the buildings are in a more advanced condition than many surrounding.

The area of the whole is something like 13,000 sq. ft. Passing through the portico, one immediately gets into the first hall, which has a superficial area of 100 ft. by 50 ft. Along the sides are a series of open-fronted rooms—mostly 10 ft. wide and 8 ft. deep. The end ones are of slightly less depth. The design of the hall is very attractive. The rooms are separated by square moulded pillars, with round pillars at the entrance and exit ways of the hall. The ceiling curves up to the glazed top light, which is being covered with transparent hangings so as to soften the light. There are concrete members in the roof; and all the surrounding mouldings are most tasteful in design. This is the hall in which domestic gas equipment will be demonstrated in all the rooms. We will not attempt to portray what will be. That is for the future; and we are now only dealing with the setting as seen to-day. Three hexagonal concrete foundations are being put in in axial line in the hall for the display of gas-fires; and the products of combustion from these, as from other gas-heated apparatus, will travel down to ducts beneath the floor—fans being used for exhaust purposes. The main part of this hall will be assigned to, and fitted as, a rest-room for visitors; and the model rooms and the central exhibits, with certain novel features which are being developed, will be the accompanying attractions. Everything has been well planned.

A short passage-way connects to the second hall, which is of the same dimensions as the first, and has similar architectural features. It is in this hall that industrial and trade processes in which gas is the agent will be illustrated and demonstrated in practical ways. The arranged programme covers a large and representative field.

There will be a perfect feast of interest in both halls, and in surroundings of which the gas industry will not be ashamed, just as it will not be of the character and efficiencies of the sample appliances for many purposes which will be on view. We are confident, from what we have seen and heard of the details of the scheme, that the Gas Exhibit will not be behind any other in the industrial section in attractiveness for the public. Those who have undertaken the responsibility of the work know what will draw and please the public. When drawn and pleased, they will be interested, and, interested, will inquire and investigate; and from Wembley they will take away to all parts of the country the information they have gained. They will see what gas can do; and they will know that what it can do in one place can be done in another, by the adoption of simple rules of management. Having been educated in this manner, application of what has been learned will follow. It is an exceptional opportunity for exceptional propaganda. The influence of it all will be widely cast, both geographically and in time. The gas industry will feel deeply indebted to the Executive and General Committee, to the President of the Exhibit (Mr. D. Milne Watson), and to the Chairman of the Committee (Mr. F. W. Goodenough) when the fine piece of work is complete and performing its mission. Brains, energy, and much labour have been put into it.

[*Photo. by Campbell Gray.*

ANOTHER VIEW IN ONE OF THE GAS EXHIBIT HALLS.

THE PIPING.

Wembley is situated in the district of the Harrow Gas Company, and that concern, it is anticipated, will before long be incorporated in the Brentford Gas Company. This Company have been,

and are, doing all the piping work required for the display, as well as throughout the exhibition. In all this, Mr. A. A. Johnston, the Engineer and General Manager, has been taking a large personal interest. The writer came across Mr. G. L. Jennings, the District Superintendent of the Company, who has been supervising the work; and from him in conversation much interesting information was gleaned. The work for the service of the Gas Exhibit comprises gas and water ways, compressed-air pipes for feeding the industrial furnaces, and the provision of ducts for the products of combustion and for ventilation purposes. For these objects electric fans will be used; and the necessary current will be provided by a 20-horse power "National" gas-engine, which will show how electrical current can be cheaply and reliably generated *in situ*. The gas piping has been sectionized; and every section will be controlled from one centre at the end of the building, where will be located a 300-light gas-meter. The piping to the industrial and water-heating section is of 3-in. diameter; and so is that for the compressed air. The gas-piping in the domestic section is 2 in., and for the lighting 1½ in.

But this has nothing to do with the system of gas-piping that has been laid throughout the exhibition. Altogether, no less than 7½ miles of mains have been laid in the exhibition area. A 12-in main runs all round it, with 10-in. and 8-in. connections from it.

Location of the Gas Exhibit.

In such a vast exhibition as this will be, the location of a special section such as the Gas Exhibit is a matter of vital importance. To have obtained such a large space in front position in the Palace of Industry is excellent. It could not have been better. The writer was satisfied on this point immediately he entered the building. In the realization of maximum success, the surroundings play an important part. Visitors who will be specially attracted by any one of them will naturally gravitate into neighbouring sections; and all the neighbours of the Gas Exhibit are going to be of a popular order. In this respect our industry's display is well favoured. Few visitors will miss making an inspection. One important neighbour is the building section; and builders and architects will be making that their first objective. There will be direct communication between the one section and the other. The public—particularly the ladies—will be attracted by the silks and textile sections, which are also neighbours, as well as by the watches, clocks, and jewellery and the pottery and glass sections. The food (and, this for whom it may concern, the whisky display) will be across the way; as will also be the furniture and music sections. And not far distant a magnificent display, judging from the space taken, is going to be made by the chemical industries. As already said, the Gas Exhibit is well favoured. The writer cannot refrain from hearty congratulation to the Committee upon their early and wise selection of an attractive site for it; and what will be upon that site will, we are confident, win the admiration generally of the men of the industry, and of that large and ordinarily scattered public who will be inspecting it.

Outside Lighting.

This is merely a preliminary article on the progress that is being made with both the huge Empire demonstration and particularly of the Gas Exhibit. It must not, however, be closed without a reference to the enterprise of the Brentford Gas Company, in securing the lighting of the vast Amusement Parks, and the avenues through it. For this purpose, upwards of 5000 low-pressure gas-burners will be employed; and it will constitute a fine advertisement for the industry. The lamp columns will be 12 ft. high, and each column will have two arms, carrying two lamps, each fitted with six burners. The columns will be 60 ft. apart; but the lamps on either side of the roadways will be only 35 ft. apart. "Wembley" lamps will be used; and these are being supplied by Messrs. Staniforth & Co., of Cricklewood.

Gas in the Catering Departments.

Messrs. Lyons and Co. are undertaking the catering for the myriads of people who will be visiting Wembley from all parts of Great Britain and abroad. The heating agent which will be used by them for the purpose is gas; and this selection has been made by a firm of unrivalled experience in catering. Apparently they know of no other agent which can effect the bulk work required so efficiently, which word includes promptitude and reliability, both of which are essentials in such a business.

From every point of view, the writer's visit to see the preparations for the Gas Exhibit caused him to leave with the deepest feelings of satisfaction. That it will be a success is assured, and that word "success" can be given the broadest and most comprehensive of meanings. Should the weather this summer be fine (and the weather prophets are already predicting it will be), the success from the point of view of numbers of visitors will be greater than perhaps it otherwise would be. But Sir Lawrence Weaver made this point to the writer: Should the summer months be unfortunately wet, from the points of railway departure in any part of the country, the exhibition buildings can be reached without once going into the open. But the British Empire Exhibition is something so unique that, wet or fine, a multitude of people will want to see it, and, what is more, will see it.

THE IDEAL HOME EXHIBITION.

Another Popular Display at Olympia.

Once more a big success has been scored by the "Daily Mail" with the eighth of their series of Ideal Home Exhibitions, which was opened last Thursday at Olympia by H.R.H. the Duchess of York, and is continuing until the 22nd inst. With the addition of the great new hall, which was first brought into public use on the opening of last year's Ideal Home Exhibition, no less than 8 acres of space are available for display purposes. This is a great deal, but not an atom too much for all that has been included. Last year, in the three weeks during which the exhibition remained open, nearly half-a-million visitors passed the turnstiles, and, judging by the huge attendance on Saturday afternoon (admittedly a more convenient day than others for most people to go there), it would not seem unreasonable to anticipate that this year the figure named will be exceeded.

The subject of the exhibition is taken from its very commencement, for there is a township of Ideal Homes, containing thirteen complete houses. These present a wide range of types, thus ensuring that the greatest variety of taste and of purchasing power is met. The fortunate people who have already a home, and are on the look-out for greater comfort or greater luxury, should go to Olympia; and the busy housewife, always on the look-out for something that will save labour, thereby economizing in the expenditure of much-needed energy, and placing at her disposal precious time that may be spent on some more important object—she, also, should go to Olympia. In other directions, several new features have been introduced this year that make an appeal to all; and there are, of course, the wonderful gardens in the annexe, which experts are of opinion are better this year than ever before. All these things, however, people must see for themselves; there is no space available here in which to make reference to them.

The Lighting and Heating Section is again in the Main Hall, while in the Main Hall Gallery there is a separate Domestic Labour-Saving Section—a title that might also properly be applied to the Lighting and Heating Section, with which "Journal" readers will, from a professional standpoint, be most concerned. Passing through this section, it is pleasing to note that gas, though perhaps not over-extensively, is thoroughly representatively displayed, in all matters appertaining to domestic economy.

The London Joint Gas Exhibit.

Woman's interest in her home may be said to be divided, as a rule, principally between the nursery (with which goes the bathroom), the kitchen and its precincts, and her own sanctum—the drawing-room or boudoir. This fact has obviously guided those responsible for the arrangement of the stand of the London Joint Gas Exhibit Committee. Here are set out in artistic and practical manner suggestions as to the many ways in which gas can serve the modern woman in a modern home—how it can secure for her the maximum of convenience, health, and comfort, with the minimum of labour, dirt, and expense. For this purpose are shown sections of a day nursery, a night nursery, a bathroom, two different types of kitchen, and "my lady's boudoir."

The furnishing and decorating have been carried out by Messrs. Heal & Son, of Tottenham Court Road—with the exception of the handsome black and gold bathroom, which has been fitted up by Messrs. Ewart & Son, Ltd., of Euston Road. All the gas lighting, heating, cooking, hot water supply, washing, ironing, bread-making, and jam-making appliances have been selected by a Committee representing the eight principal London Gas Companies—namely, the Gas Light and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, the Brentford Gas Company, the South Suburban Gas Company, the Tottenham District Light, Heat, and Power Company, the Wandsworth, Wimbledon, and Epsom District Gas Company, and the Croydon Gas Company—and the whole display and its setting was planned and designed by Mr. H. Austen Hall, F.R.I.B.A., a Past-President of the Architectural Association. It will therefore be readily realized that the exhibit is worthy of careful study from all points of view—the artistic, the practical, the economic, and the hygienic.

On the last-mentioned point—the hygienic aspect of the use of gas in the home—the most complete and convincing evidence of impartial and scientific authorities is provided by the London Gas Exhibit Committee. They are able to point to the practical testimony of leading physicians and surgeons, who both recommend and use by the thousand gas-fires and gas cooking stoves; to the result of scientific research by "The Lancet" and other independent investigators; to the extensive and growing use of gas in hospitals, sanitoria, and nursing homes; and to authoritative pronouncements as to the hygienic merits of gas lighting.

In the bathroom is installed a "Euston" gas-heated towel rail, which serves the dual purpose of airing towels and clothing and warming the room; and there is a Ewart "Califont" for supplying hot water to the bath and the lavatory basin.

The boudoir is heated by an artistic gas-grate, finished to harmonize with the general scheme of decoration, as are also the Sugg burners, which shed a restful light around.

The "middle-class" kitchen serves to illustrate the utility and cleanliness of gas, mainly for the purpose of cooking and hot water supply; and here, together with the essential gas-cooker, is

a Potterton No. 921 hot-water set. A coke boiler nearby serves as a reminder of a useful and economical alternative to gas. Gas also, as is shown, can be most conveniently employed, in a special apparatus, the Davis "Burn-All," which takes up little room, for the purpose of refuse destruction. Heating, too, is not forgotten, a fire being installed alongside the cooker; while a gas-iron and gas-heated wash boiler demonstrate the other labour-saving uses of gas in this all-important section of the home.

Two other sections of the stand are devoted to the application of gas in the nursery. In the day nursery a cupboard on the left-hand side of the fireplace (where a gas-fire is fitted) is opened, and found to contain a Parkinson "New Treasure" geyser and tip-up bath; while on the right-hand side another cupboard contains a small cooker and sink adjoining. The nurse can therefore attend to all the material wants of her charges without having to leave them for a minute. This room is lighted by "Metro" and "Brentford" burners. At bedtime the night nursery is warmed and ventilated by a gas-fire, and lighted by "Nico" burners suitably shaded.

The next section is designed to illustrate the worker's kitchen, and here will be found a gas-cooker, together with a Wright "B.T.U. Maisonette" circulator, while a gas wash-boiler again reminds the visitor of the usefulness of gas when washing day is at hand. A gas-iron on the table completes this aspect of the housewife's duties.

Mention of the last-named appliance recalls the fact that on a platform adjoining the stand a practical demonstration is given at periods throughout the day of the "Metro" gas-iron of the South Metropolitan Gas Company and the "Crystal" gas-iron of the Davis Gas-Stove Company. In the middle-class kitchen, too, the making and baking of cakes proves a further attraction to visitors of both sexes.

All the tasteful lighting fittings have been supplied by Messrs. Evered & Co., and are operated by the well-known pneumatic switch; while the artistic shades are by Messrs. Louis Dernier & Hamlyn, Ltd. The attractive flambeau lights on the exterior of the stand are by Messrs. William Sugg & Co., and are controlled by their patent distance valve.

In those cases in which the makers' names are mentioned in the course of the foregoing notice, the apparatus referred to has been installed for the period of the exhibition, these items being in connection with hot-water service. With regard to cookers, fires, and other appliances, the London Joint Gas Exhibit Committee have again adopted the good plan of making a change when the exhibition has run half its course. In these circumstances, in place of a statement of the precise makes of apparatus in position when the stand was inspected last week (which would only remain correct for a few days longer), there is given below a list of the sections, with a description of the appliances and the makers' names—in the first place for the period from Feb. 28 to March 8, and then for the period from March 10 to March 22.

Boudoir.—Richmond Gas Stove and Meter Company, "Marlborough" fire; R. & A. Main, "Gibbon" fire.

Middle-Class Kitchen.—Cannon Iron Foundries, "Rose" fire, black; Parkinson Stove Company, "Conrad" fire, black; Davis Gas-Stove Company, "Alpine" cooker, on stand; Alan Johnston & Partner, "Regulus" cooker; Davis Gas-Stove Company, "Sentry" boiler; T. Balmforth & Co., "Koke" boiler; Cannon Iron Foundries, nickel plated gas-iron, with stand; Davis Gas-Stove Company, "Crystal" gas-iron, with stand; Cannon Iron Foundries, 10-gallon wash boiler, with lid; W. Sugg & Co., 10-gallon "Marlborough" boiler, with lid.

Night Nursery.—J. Wright & Co., "Rubens" fire, bronze; Wilsons and Mathiesons, Ltd., "Adelphi" fire, electro bronze.

Day Nursery.—Fletcher, Russell, & Co., Ltd., "Hamilton" fire, electro copper bronze; South Metropolitan Gas Company, "Metro" fire, bronze or black; Davis Gas-Stove Company, "Wee" cooker, with stand; Wilsons and Mathiesons, "Gem" cooker, with stand; Keith Blackman Company, domestic gas-iron; Fletcher, Russell, & Co., domestic "New" iron and stand.

Workers' Kitchen.—Richmond Gas Stove and Meter Company, "Bungalow" cooker; R. & A. Main, "Maintenance" cooker; Richmond Gas Stove and Meter Company, 10-gallon "Blackfriars" wash-boiler; Parkinson Stove Company, 9-gallon "Economic" wash-boiler; Davis Gas-Stove Company, "Crystal" gas-iron, with stand; South Metropolitan Gas Company, "Metro" gas-iron; Keith Blackman Company, "O.C." boiler; Bruster and De Launoit, "Glow-Worm" coke-boiler.

Radiation, Ltd.—The "New World" Cooker.

No visitor to Olympia can fail to be attracted by the striking display made by Radiation, Ltd. A large stand, entirely open, so that all can pass round and inspect each piece of apparatus placed upon it, is entirely devoted to the Company's "New World" cooker, which can thus be seen in actual use under perfectly comfortable conditions. In the centre of the stand is a pedestal surmounted by a large revolving globe, bearing upon it the name of this excellent new gas cooking appliance, which has been aptly termed "the cooker with a personality." The housewife visiting the exhibition in search of real labour-saving devices certainly will not find anything more ingenious than the "New World" cooker.

Possibly the greatest point in favour of this cooker is that in using it one does not have constantly to be running to and fro to see how the dish that is cooking "is getting on." The special characteristic of "looking after itself" is secured on the "New World" cooker by the "Regulo" heat controller, which automatically regulates the temperature. For instance, supposing you wish to cook a chicken, the handy chart supplied with the "New World" cooker tells you to set the pointer of the "Regulo" to Figure 7, and leave the chicken in the oven for 30 minutes. The "Regulo" is set as directed by a simple hand movement; and when this is done, the oven can be left to look after itself, with the comforting assurance that a perfectly cooked meal will result.

Another striking feature of the "New World" cooker is the "Rado" burner. From this burner one obtains three distinct varieties of flame, each giving a different degree of heat. To change from one to the other is simply a matter of turning a tap. The first quarter-turn furnishes a "full on" supply for rapid heating; the next quarter-turn gives a "simmering" flame for gentle boiling; and with a further small turn a "minimum" flame is obtained suitable for prolonged stewing.

From the crowds of visitors who have constantly thronged the Radiation stand since the opening of the exhibition, it is evident that the Radiation cooking and heating devices are enhancing their already high reputation with the public.

Potterton Hot Water Supply Apparatus.

The exhibit of Mr. Thomas Potterton, Cavendish Works, Balham, S.W., comprises a general display of the latest types of "Victor" boilers and complete apparatus for domestic hot water supply and heating purposes, as well as various forms of domestic coke boilers as examples of combined equipment. "Victor" boilers are in action demonstrating the many ways in which gas can be usefully employed in the house, office, or factory, and the fact that, properly applied, gas apparatus is the most convenient and reliable fuel available.

One important feature of the exhibit is the complete equipment, in a tiled recess, of a "Victor-Combination" boiler set with a "Brentford" cooker, showing an up-to-date and comprehensive arrangement for the ordinary villa residence, flat, or cottage. This boiler plant gives the utmost flexibility in action by providing radiant warmth in the kitchen from the convertible coke boiler unit, which, in addition to operating the domestic hot water supply, will serve two or three radiators for low-pressure warming during the winter months; the gas-boiler being available for supplementary action in the winter, and the full duty of domestic hot water supply in the summer.

Another useful example of complete hot water and cooking equipment of the latest type occurs in a set comprising a "Victor" complete apparatus No. 921, coupled to a "Domestikatum" coke boiler for winter duty in supplying hot water and doing a certain amount of cooking, provision for which latter requirement is completed by a cooker of the "Brentford" design. This equipment is, where space is available, regarded as an eminently suitable alternative to the installation previously described.

The "H" series "Victor" boiler, No. 92 size, is applied to demonstration purposes on the hot water supply section of the exhibit. This heater embodies all the factors of importance in boiler design—automatic control of the heating effect, lightness, easy maintenance, and low cost. Like all "Victor" boilers, it is of sectional construction, by which complete control of the products of combustion is obtained, and also the ratio of heating surface essential to the production of the requisite circulating temperature.

Another section of the working portion of the exhibit is a "D" series No. 20 boiler applied as an independent system for working a series of radiators upon the low-pressure hot water system, which is eminently suitable for offices, halls, garages, and other duties of moderate proportion. It is controlled by an air thermostat of the special type introduced by this firm, and demonstrates the great utility of gas for maintaining a satisfactory temperature in living rooms and for various manufacturing processes.

There are also shown, not in action, single boiler and twin boiler sets, and the self-contained portable sets largely adopted by the London County Council, in the South Metropolitan Gas Company's area, and elsewhere, in connection with housing estates, and for similar purposes. To those districts having soft water, copper apparatus with rustless boilers is of interest, as it alleviates any difficulty from discoloration in the service for domestic hot water supply purposes. Again, in connection with domestic hot water supply, a system is shown for treatment to eliminate hardness, iron, or other impurities; and this can be demonstrated in action to those interested.

Gas for Display.

It is possible at Olympia to make a comparison between incandescent gas-light and incandescent electric lamps for the display of goods for exhibition purposes, inasmuch as four of the stands have been provided with excellent "Metro" lamps and "Metro" fittings by the South Metropolitan Gas Company. The stands referred to—which "JOURNAL" readers, of course, would not be likely in any circumstances to miss on visiting the exhibition—are those of Mr. Thomas Potterton, the New Stimex Gas-Stove Company, Messrs. J. Stott & Co., and the Flavel stoves. These tasteful and efficient installations, conveniently arranged with pneumatic switches, demonstrate the superiority of the soft diffused light afforded by gas for the purpose to which it is here applied.

Reference to other gas exhibits must be deferred for a week.

(To be continued.)

A NEW HOLDER AT DUNDEE.

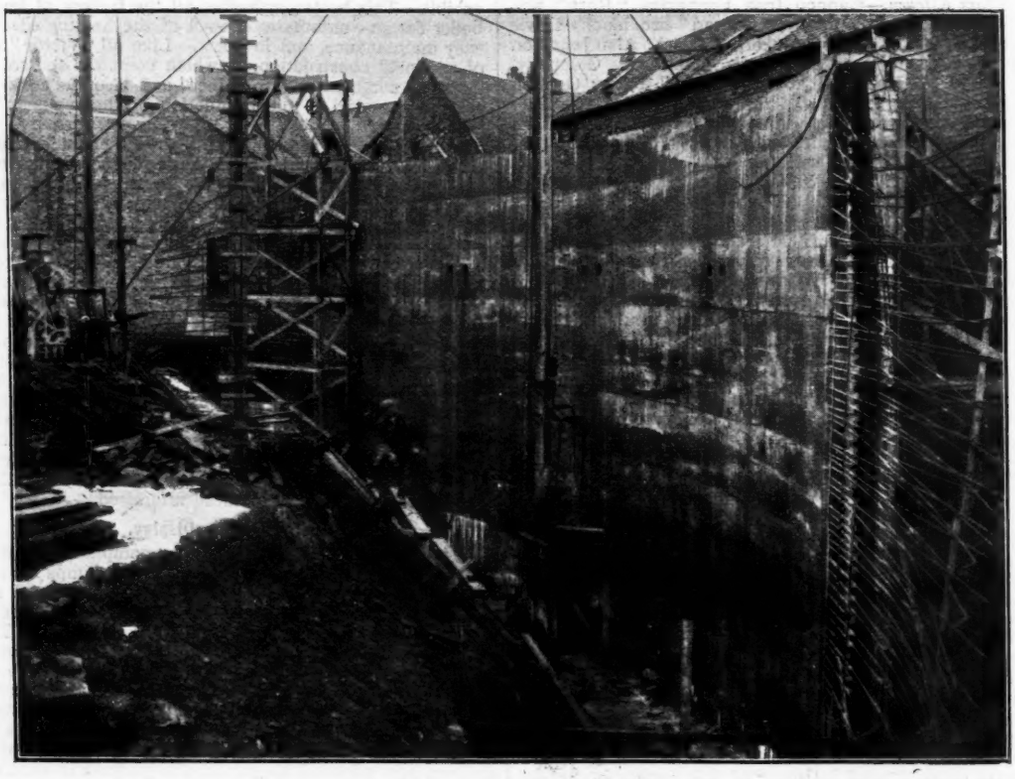
LORD PROVOST HIGH OPENING THE VALVE OF THE DUNDEE GASHOLDER.

The largest three-lift spiral gasholder in Scotland, which stands in what is claimed to be the biggest ferro-concrete tank in the British Isles, has just been completed in Dundee, and Lord Provost High recently performed the ceremony of turning on the gas into the holder, in the presence of a number of members of the Dundee Town Council and other councils and gas engineers of neighbouring burghs. Messrs. R. & J. Dempster, Ltd., of Manchester, were the contractors for the holder, which has a capacity of 2,250,000 c.ft., is 176 ft. in diameter, and when fully loaded will rise to the height of 163 ft. above ground level. The cost of the holder was about £100,000.

The Ceremony.

Mr. J. S. Brown (Convener of the Gas Committee) said that the Council first proposed going on with the provision of additional holder accommodation in 1914, but owing to the outbreak of the war the scheme had been postponed. At the end of the war it was found to be absolutely necessary to proceed with the work. The storage capacity at the present time, without the new holder, was something under 2 million c.ft.; and, as the present daily consumption was between 5 and 6 million c.ft.—in January it was 7 millions per day—it would be seen that the department had not yet enough capacity to store 24 hours' supply.

Lord Provost High, in turning on the supply of gas to the holder, said that he had had a good deal to do with the Gas Department and their work. Their labours had greatly increased during the last few years, and much of the success had been due to the energy and ability of the Engineer, Mr. Alex. Yuill. (Applause.) The additional accommodation provided should make it possible for the people in Dundee always to have a sufficient supply of gas, if the inlet pipes to their houses were large enough to take in the required quantity.



THE FIRST STAGES OF THE WORK ON THE REINFORCED CONCRETE TANK FOR THE DUNDEE GASHOLDER.

The sides of the tank were built in seven sections, of which this view shows the first. Of course it is usual to build tanks in horizontal rings rather than in vertical sections.

Mr. J. W. SCOTT (of Messrs. R. & J. Dempster) thereafter presented Convener Brown with a silver statuette representing Art, on an ebony base, as a souvenir of the occasion.

The holder was gaily decorated, and the flags were so arranged as to give the initial letters of the Dundee Gas Commissioners and the Contractors.

LUNCHEON.

The numerous party afterwards sat down to luncheon in the Marryat Hall—Lord Provost HIGH presiding.

The toast of the "City and Trade of Dundee" was submitted by Bailie HUNTER (Convener of the Perth Gas Committee). First of all, he conveyed the congratulations of the citizens of Perth to Lord Provost High on his appointment as civic head of the City of Dundee. The Bailie thereafter gave a description of Dundee as it was a hundred years ago, and said that if as much progress was made within the next hundred years as had been made in the past, the citizens of that time would bless the names of the men who had worked towards that success.

Treasurer JOHNSTON, who replied, said it was often found that people outside the city had a better knowledge of the history of Dundee than the Dundonians had. Touching on the present day, he thought they could rank Dundee as one of the most progressive cities in Scotland. Much remained to be done, however, before the city would be anything like what they desired it to be. The great improvement schemes had been delayed by the war; and in consequence of the war these were to be more difficult and expensive questions than the Council had imagined that they would be. The point to be considered in the improvement schemes now was the ability of the ratepayers to pay. They would like to see something else replacing the Overgate and other places; but while, like other members of the Council, he might be a bit of an idealist, as Treasurer he had to consider the question of ways and means. It was to be hoped that the trade in the city would in the future put both employer and employee in a position to be able to pay the rates necessary for the improvements desired. The Railway Companies had approached the Council for permission to boom the city as a holiday resort, and as a result of this action it was to be hoped that the Labour Government would come forward and pay the whole of the expense of the proposed road bridge across the Tay, in order to give the jaded inhabitants of the South every opportunity of reaching Dundee.

Mr. J. W. M'LUSKY, of Glasgow, proposed "The Gas Department of the Dundee Corporation," and on behalf of the Glasgow Corporation congratulated Dundee on this important development in the gas undertaking. As a gas engineer, it was only natural that he should associate the Dundee Gas Department with its guide, philosopher, and friend, Mr. Alex. Yuill, the Manager. Mr. Yuill had now attained his majority in the service of the Dundee Corporation, and the development of the department had been most remarkable. In these 21 years, while the whole of Scotland had only advanced some 40 p.ct. in the sales of gas, Dundee had extended to 150 p.ct. Their consumers were 30 p.ct. increased, and they were the third undertaking in Scotland to adopt free cookers. They had, however, a very low capital account. They had no right to be so long in putting up a holder. It was precarious for a gas undertaking to sell in one day double the gas that it could store. He congratulated the undertaking on completing this great development, and would associate with the name of Mr. Yuill Mr. Hislop and Mr. Johnston, his assistants.

Convener BROWN in reply, said the great question was whether there was going to be any decrease in the price of gas this year. He was not yet in a position to say; but the citizens could rest assured that a cut would be made if it was possible. Twenty-one years ago the capital cost per million cubic feet manufactured and sold was £645; to-day, notwithstanding the large development, the capital cost was only £291 per million. When the Electricity Department was established in 1906, the death of the Gas Department was prophesied; but gas still had a future before it, and it was possible that at an early date the Council might be asked to face the necessity of adding still further to the holder capacity of the department. Credit for much of the development was due to the capabilities of Mr. Yuill. (Applause.) Mr. M'Lusky had done them a good service in pointing out the dangers of not having sufficient storage capacity. Their holder capacity was only 4¼ million c.ft., and their output was between 5 and 6 millions per day. He wanted to put it to them as business men whether that was a safe position, and whether in the near future they must take into consideration the provision of more storage.

The toast of "The Contractors" was submitted by Bailie MALCOLM. The Council could not keep the contract within the city, he said. For certain things they had to rely on the work of residents in other cities.

Mr. J. W. SCOTT apologized for the absence of Mr. Charles Dempster (Chairman of Messrs. R. & J. Dempster), and said that Dundee had now the largest spiral gasholder in Scotland. He pointed out many of the difficulties they had had to overcome in establishing the spiral holder, and how it had attained its present efficiency. In the early days Messrs. Dempster had to guarantee their work against all risks; but their faith had been fully justified, and they had obtained valuable experience in gasholder construction through having to inspect the working during the guarantee period. The Dundee holder was in an exposed position. They had, however, erected a large spiral at Shanghai, and when the users found it was not affected by typhoons, they ordered others, and dismantled their framed holders. He congratulated Mr. Yuill on adding to his long list of records, and thanked him and his staff for their kindly assistance and courtesy during the execution of the work.

Mr R. QUINTON (representing Messrs. K. Holst & Co., Ltd., London, the builders of the ferro-concrete tank) said that ferro-concrete had not been used so much in this country as on the Continent. The tank erected for the holder was the largest ferro-concrete tank in the British Isles. Mr. D. HORSBURGH, Dundee (Contractor for the excavations), also replied.

Mr. DAVID VASS (Gas Engineer of Perth) proposed the toast of "Mr. Yuill and his Staff."

On the call of ex-Lord Provost SPENCE, a hearty vote of thanks was accorded to Lord Provost High.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

ANNUAL DINNER AND CONCERT.

In the Cambridge Room of the Great Eastern Hotel, Liverpool Street, E.C., last Saturday evening, was held the eleventh dinner and concert of this vigorous organization which, though a Junior Association, has already attained its majority, having been founded as long ago as 1902. About 130 members, ladies, and guests, sat down under the chairmanship of the President of the Association, Mr. Walter Grogono, of the Fulham Works of the Gas Light and Coke Company; and among those at his table were Mr. W. B. Leech, Engineer at the Beckton Works of the Gas Light and Coke Company, Mr. T. S. F. Gibson, Chief Civil Engineer of the South Metropolitan Gas Company, and Mr. John Terrace, Chief Engineer of the South Suburban Gas Company. There were also present Mr. W. Newton Booth (Senior Vice-President), Mr. W. L. Westbrook (Junior Vice-President), Mr. Leonard Lacey (Hon. Secretary), Mr. W. H. Noble (Assistant Hon. Secretary), and Mr. A. Broadbent (Hon. Treasurer). Messrs. George Winslow, Lloyd W. Worth, and W. H. Noble acted as Stewards. Of the dinner itself and the subsequent programme all that need be said is that both proved as enjoyable in every respect as those present had been led, by their experience of previous similar functions, to anticipate. After the honouring of the Loyal Toast, at the call of the President,

Mr. W. B. LEECH proposed "The Association." The fact of the President being an old friend of his, he said, added to his great pleasure at being with them that evening. He had known Mr. Grogono for a considerable number of years. They had worked together at Beckton on the reconstruction of the gas-making plant there; and during the time Mr. Grogono was with him he had learned to appreciate his sterling qualities. He felt sure the Association must have benefited greatly by his guidance as President. One particular matter upon which he would like to congratulate the Association was the number of new members enrolled this year, which he believed was 40. This gave a total membership of 300, a figure that spoke exceedingly well for the work that was being done. The papers and discussions, as well as the visits, must be of benefit to all of them. It was very difficult for anybody to go to another person's works without taking in something of which he could make use. He himself had just returned from a visit to the Continent, where he had seen plant and other things which would give him suggestions for the future. The last time the Association visited Beckton, he remembered, there was a remarkably good muster. They had not, however, been there for nearly three years now, and in the meantime still more work had been carried out. He was wondering whether the Association would care to go to Beckton again some time next year. Turning to the work of the juniors, it always seemed to him that the best way to "bring them on" was to give them definite responsibilities, and also to give them credit for the things they did. At Beckton, they did try to make the staff take their jobs right from beginning to end. This was excellent training for the future engineer; and he thought it was the duty of every senior to see that his staff got full opportunity of acquiring knowledge and fitting themselves for taking charge, as they would have to do in due course, of the future of the industry.

Mr. W. NEWTON BOOTH responding, remarked that he had been very much impressed by Mr. Leech's suggestions. That the seniors should endeavour to give the juniors of the industry definite responsibilities was a very important thing. That they should be allowed to see a job right through was still more important. It was also of great importance that when a job had been well done appreciation should be expressed of the efforts of those who had done it. If only the seniors would take careful note of Mr. Leech's suggestions, a junior's life would always be a happy one, and this would be reflected in his service. Recalling the inception of the Junior Association movement, he emphasized the great work that these bodies have since been doing in affording to members additional educational facilities and means of increasing their experience. By their good work, the Junior Associations had attained a position which was recognized by the whole of the industry.

The toast of "The Visitors" was in the hands of Mr. F. A. FROST, who pointed out that the prosperity enjoyed by the Association to-day was not altogether the result of their own unaided efforts. All along their Association had been fortunate in having the active support of a large number of gentlemen connected with the industry, who had rendered them great assistance in a variety of ways.

Mr. T. S. F. GIBSON expressed the hope that the members would have as good a time on the occasion of their forthcoming visit to Old Kent Road as they were enjoying that evening.

"The President" was proposed by Mr. D. C. CROSS, who characterized Mr. Grogono as a good President and a real man. They were proud to have him at the head of the Association, the traditions of which he was worthily upholding.

In his reply, Mr. GROGONO related some of his early experiences, and remarked upon the happy conditions under which his work had been carried out right through. Mr. Leech had suggested another visit by the Association to Beckton next year; and on Mr. Newton Booth's behalf, he (the President) had much pleasure in accepting this proposal. They would see an altered Beckton when they did go there.

The remaining toasts were "The Secretary and the Treasurer," proposed by Mr. H. W. KERRIDGE, and responded to by Mr. LEONARD LACEY and Mr. A. BROADBENT; and "The Press," which was submitted by Mr. W. L. WESTBROOK. In the course of his reply, Mr. LACEY acknowledged the great help which he had received, in his comparatively new duties, from Mr. George Winslow and the Assistant Secretary (Mr. W. H. Noble).

A STUDY OF THE DESTRUCTIVE DISTILLATION OF COAL.

By E. V. Evans, O.B.E., F.I.C., Chief Chemist and Products Manager of the South Metropolitan Gas Company.

[The Second of a Series of Three Cantor Lectures delivered at the Royal Society of Arts. Monday, March 3.]

LECTURE II.

In the first lecture it was demonstrated that to determine alone the gaseous thermal yield in the carbonizing process was useless from the point of view of computing the efficiency of that process. It was shown that, though high gaseous thermal yields could be obtained with a hole in the retort or a leak in the mouthpiece, there was always a loss of true coal gas, the extra gas therms being made indiscriminately at the expense of another therm-containing constituent of the coal. It followed that the greatest economy was to be attained by carbonizing in a tight retort, and, if dilution were needed, that this should be done by the admission of a carefully-controlled diluent gas.

Experience has shown that, if a system of very tight retorts is operated at a combustion-chamber temperature of 1300° C., and maintained under a reasonable vacuum of 3-tenths water gauge, the gas manufactured possesses the characteristics shown under A in fig. 1. Such a gas contains so small a percentage of inert constituents, and consequently so low a density, that it is unsuitable for use in the inverted bunsen-burner. There are many methods of adjusting the composition of this gas, as, for example, by adding under control water gas, producer gas, or waste gases. It was imagined that the least economic method would be to reduce the calorific value by raising the temperature of distillation, whereby undue degradation of the gas itself might result. It was decided, therefore, in the case in point, to add waste gases to the crude coal gas prior to purification. The effect of adding waste gases—*i.e.*, inert constituents—to the gas on its calorific value and specific gravity is shown in fig 1. It was desired to add a proportion of waste gas sufficient to remove point A on the curve to B in order to produce a gas of 572 B.Th.U., which, upon subsequent admission of air to the purifiers, would be reduced to the desired calorific value. The installation used for this purpose is shown in fig. 2. A small exhauster drives the required volume of waste gases through the large meters shown in the illustration, and the quantity is very carefully controlled by reference to the recorded calorific value of the gas before and after treatment. The calorific value curves shown in fig. 3 demonstrate, in the case of the two upper charts, the nature of the gas made in the retort-houses and before adjustment, and in the lower chart the nature of the gas after dilution. It will be seen that a remarkably constant gas, from the point of view of calorific value, is delivered into the holders.

Volatile Therms.

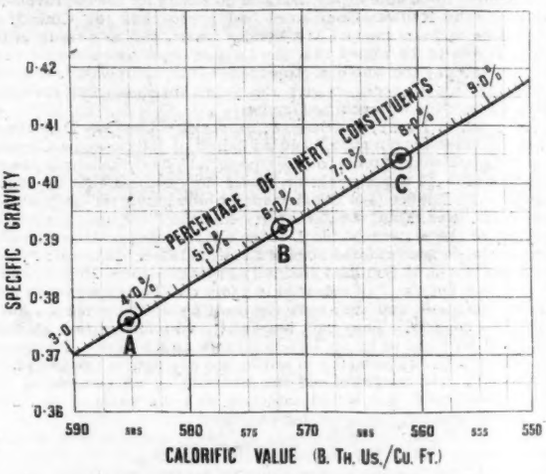
The great advantage of such an installation lies in the constancy of the thermal value of the gas, and the closeness with which the declared calorific value may be approached. This is not only of advantage to the consumers, but also to the gas manufacturer, who is frequently forced to supply a gas of calorific value materially higher than that declared, in order to be assured that the minimum calorific value never approaches the 6 p.ct. penalty limit. The net result of operating the installation above described is to produce without marked degradation of gas or tar a 560 B.Th.U. gas of very constant physical characteristics; but no apparent increase in gaseous thermal yield has been observed. This has been found to be due to the fact that, when higher temperatures are maintained for the purpose of decomposing the gas down to the required standard, a certain degree of tar cracking takes place. This does not occur with the adjustment plant in operation; and, in consequence, a higher yield of tar is obtained. Whether or not it is advantageous to crack tar into gas is a question of economics which will receive consideration later; but the point to be made at this stage is that, whereas it has been shown in the first lecture that the thermal yield of gas alone is of no use in computing the efficiency of the process, the conclusion is now arrived at that, as the therms of tar and gas are interchangeable, no true appreciation of results may be obtained unless the thermal value of tar be also taken into account. In controlling the carbonizing process, it is necessary, therefore, to determine not only the yield of gas therms, but also of tar therms, for the one is convertible into the other. It is convenient to class these together under the heading of "volatile therms." Results of working may thus be expressed as follows—that there has been obtained a total yield of 90 volatile therms, of which 73 are in the form of gas.

In this lecture it is proposed to deal solely with the very close relationship existing between gas and tar, as the author does not think this subject has in the past received sufficient attention by the gas industry.

The introduction of the therm system has rendered practically useless the investigations of men in the gas industry who have expressed their results in terms of cubic feet of gas of a certain illuminating power per ton of coal. This is to be regretted, but it is the result of circumstances. The absence of data relating to the calorific value of the tar recovered is not so serious an omission, in view of the fact that an average figure may be taken for the purpose of ascertaining a very approximate tar thermal yield; but the fact that investigators have failed to note the volume and nature of tar recovered, when studying the effect of varying conditions upon the carbonization process, shows a lack of appreciation of the part that may be played by tar. The results of sound investigations in the gas industry to-day are expressed upon the basis of the thermal yield of each of the products, gas, tar, and coke, but many of the reports, dissertations, and claims appearing in our gas literature to-day are entirely misleading, as they are made by investigators who have failed to appreciate the thermal inter-relation between the three products derived from the carbonization of coal. While one works is able to obtain 80 therms of a gas which is obviously not true coal gas, another obtains a high yield of a gas the analysis of which indicates that it must have left behind pitch, instead of tar. No data, however, are given concerning the yield and nature of the resulting tar, so that it is impossible to obtain any accurate conception of the efficiency of the carbonization process. If one is looking for high gaseous thermal yields, and if

DIAGRAM 4

CURVE SHOWING THE EFFECT OF ADMISSION OF INERT CONSTITUENTS UPON THE SPECIFIC GRAVITY AND CALORIFIC VALUE OF GAS.



GAS ANALYSES

	A		B		C	
	585·1 B. Th. U. GAS		571·8 B. Th. U. GAS		561·4 B. Th. U. GAS	
	%		%		%	
C_nH_m	3·23		3·16		3·10	
CO	7·30		7·13		7·00	
CH_4	31·06		30·35		29·80	
H_2	54·61		53·36		52·46	
CO_2	0·65	3·6%	1·95	6·0%	1·40	7·7%
O_2	0·2		0·2		0·2	
N_2	2·95		4·75		6·10	
Sp. Gr.	0·376		0·392		0·404	

Fig. 1.

the whole of the volatile matter is expelled from the coke, then there is a certain limit beyond which gas must be manufactured at the expense either of coke or of tar, and the investigator who, in studying the effect of certain carbonizing conditions, overlooks this, paints only half a picture, and obtains results which bring little enlightenment to the gas industry. The importance of considering the yield of volatile therms will be apparent when it has been demonstrated how the nature of the distillation process affects this yield and the proportion of gas therms to tar therms.

Rate of Carbonization in Relation to Yields of Gas and Tar Therms.

The results of an investigation carried out to determine the effect of the rate at which the coal charge is heated upon the relation between the yield of gas therms and tar therms will now be examined. The results of this investigation are embodied in Table A. These tests have been carried out upon only 100 grammes of coal, but, to secure uniformity, a large sample has been finely ground, and small briquettes have been made of the mixture (without binding material), for the purpose of obtaining homogeneous samples. The author is well aware that carbonizing trials on such a small scale are likely to be misleading. These results, in so far as they relate to the points in question, are

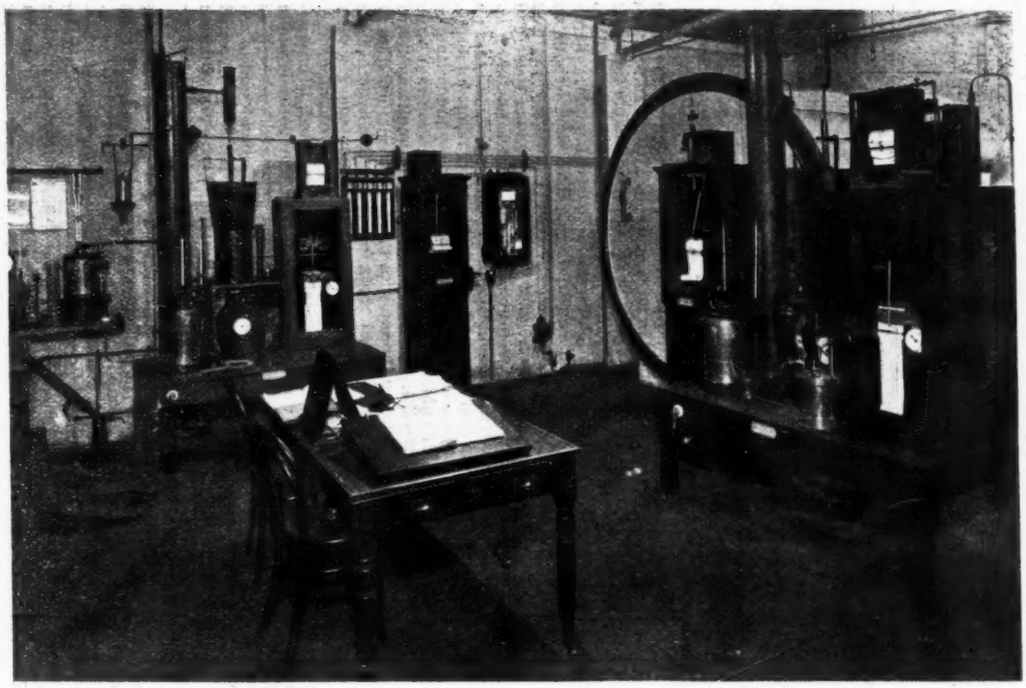
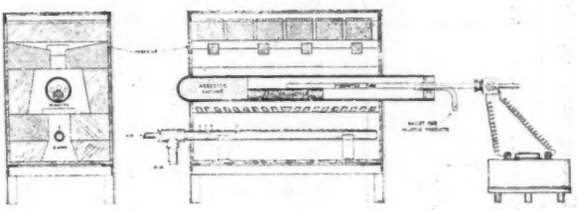


FIG. 2.

FURNACE USED IN THE CARBONIZATION OF BRIQUETTED COAL AT VARYING RATES

generally in accord with works practice, and it is on this account that they may be considered to possess technical interest.

The apparatus used for these small-scale carbonizing trials consisted of a 2-in. diameter silica retort 24 in. in length, packed at its closed end with asbestos. This retort was charged with five cylindrical briquettes placed end to end, and occupying some 7 in. length within the retort. A pyrometer was fitted to the retort, which was plunged either into a fully heated furnace or into one the heat of which was gradually increased over a definite period, the final temperature attained within the retort being the same in all cases. A sectional view of the furnace is shown in fig. 4, while fig. 5 is a photograph of the whole apparatus. For the purpose of this lecture, and until a detailed description of the work is published, the author wishes it to be assumed that the construction of the apparatus, and its manipulation, together with



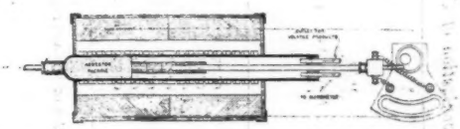


Fig. 4.

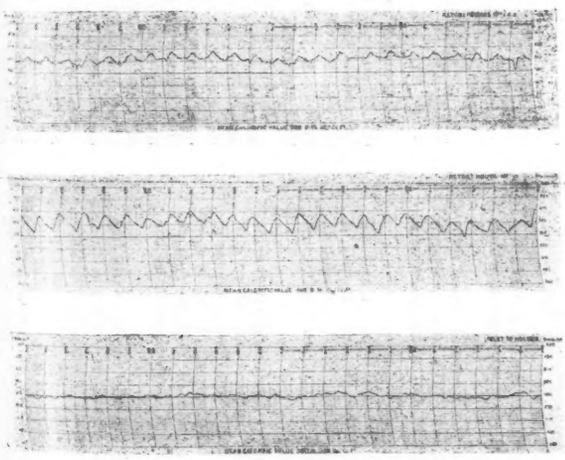


Fig. 3.

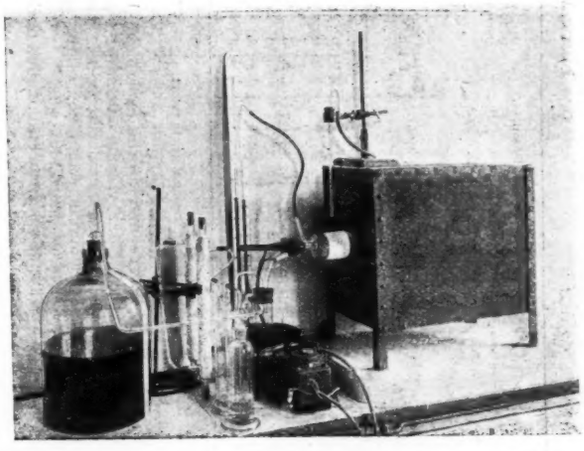


Fig. 5.

weighing and analytical operations, were carried out in an approved manner.

It will be observed from Table A that the final temperature attained in this series of carbonizations was 1000° C., but that the time taken to attain this temperature varied from 18 minutes to 13 hours. In the first experiment the retort was placed in a furnace already heated to 1000° C. In this respect this experiment differed from the remaining carbonizations, in which the furnace was gradually heated up until a temperature of 1000° C. was attained in the retort within the required time. An important point to be made is that, however quickly the final temperature, as observed by the pyrometer, was reached, the carbonizing process was always practically finished at this stage; and though each test was extended for some time after the final temperature was attained, the quantity of the products distilled was found to be small. In computing the results of all experiments, a correction has been made for the residual gas in the

TABLE A.—*Carbonization of Coal at Varying Rates* (100 *Grammes Typical Durham Coal, Briquetted*).

Time Taken to Reach 1000° C.		Yields of Products. Per Ton of Coal. Coke.	Tar.	O_2 and N_2* Free Gas.	Liquor.	Carbon and Pitch.	Total as P.Ct. Original Coal.	P.Ct. Volatile Matter in Coke.	P.Ct. Composition of O_2 and N_2 Free Gas. CO_2.	C_nH_m.	CO.	CH_4.†	H_2.	Calorific Values of Products (Gross). O_2 and N_2 Free Gas B.Th.U. per C.Ft.	Coke. B.Th.U. per Lb.	Tar. B.Th.U. per Lb.	Distribution of Heat Units in Products. Therms per Ton of Original Coal. Coke.	Tar.	Gas.‡	Carbon and Pitch.	Total Volatile Therms.	Total Non-Volatile Therms.	Process Yield of Therms. Per Ton of Coal.	P.Ct.
Hours	Mins.	Cwt.	Galls.	C.Ft.	Galls.	Lbs.																		
0	18	13·0	13·2	12,880	16·6	23·6	97·5	0·25	2·3	5·4	9·85	24·45	58·0	595	13,410	13,650	195	21·6	78·1	3·4	99·7	198·4	298·1	92·0
0	40	13·15	12·2	12,450	15·4	33·6	97·7	0·15	2·7	4·85	8·75	27·2	56·5	600	13,390	14,840	197	21·6	76·3	4·9	97·9	201·9	299·8	92·6
1	40	13·2	18·4	11,230	15·7	15·7	97·2	0·68	2·5	3·1	8·8	30·7	54·9	586	13,580	14,420	200	29·1	67·3	2·3	96·4	202·3	298·7	92·3
1	40	13·25	17·7	11,690	13·0	24·6	96·9	0·28	2·9	2·85	8·65	28·3	57·3	563	13,435	14,520	200·5	28·3	67·2	3·5	95·5	204·0	299·5	92·5
3	15	13·5	14·0	12,350	15·2	9·0	97·1	0·47	2·7	2·4	10·1	28·6	56·2	556	13,380	15,890	203	24·6	70·2	1·3	94·8	204·3	299·1	92·4
13	0	13·7	13·4	11,870	14·5	30·2	97·2	0·33	2·6	2·0	8·1	32·9	54·4	577	13,535	14,740	206	19·8	70·0	4·4	89·8	210·4	300·2	92·7
13	0	13·7	11·2	12,020	16·1	26·9	97·4	0·31	2·8	1·8	8·4	33·0	54·0	572	13,435	16,145	207	18·1	70·3	3·9	88·4	210·9	299·3	92·4

All gas measurements are made at 60° Fahr. and 30 in.

* This does not include residual gas in retort. † CH_4 includes ethane and other saturated hydrocarbons. ‡ A correction of + 1·5 therms per ton for residual gas in retort and other apparatus has been applied.

retort and other apparatus at the end of the experiment by adding 1·5 therms per ton to the yield of therms calculated from the volume of gas actually collected and its calorific value. This figure was based upon an experimental determination of the approximate composition and volume of the residual gas.

The following points will be noticed from an examination of the table:

(1) The yield by weight and the total thermal content of the coke increase slightly as the rate of heating decreases.
(2) The tar by weight and thermal content increases rapidly to a certain maximum, and then falls off.
(3) The thermal yield of gas falls rapidly as the rate of heating decreases, until a certain limit is reached, beyond which there is no further reduction.
(4) The carbon and pitch (which is the material other than coke left in the retort after the test) falls to a minimum both in weight and thermal content, but again rises with exceedingly slow carbonization.

It will now be of interest to study the relationship existing between gas therms and tar therms, and the effect of the rate of carbonization upon the total number of volatile therms produced. The two most important observations to be made in this connection are:

(1) The total volatile therms computed by adding tar therms and gas therms show a gradual decrease as the rate of carbonization becomes slower, and a marked decrease in the case of exceedingly slow carbonization. There is thus a lower, rather than a higher, yield of volatile therms resulting from the slow and careful carbonization of the charge.
(2) That, though the yield of total volatile therms falls but gradually with a reduction in the rate of carbonization, the ratio of gas therms to tar therms undergoes considerable variation. It will be observed that, whereas rapid carbonization favours the production of gas, slow carbonization, up to a point, has the effect of preserving tar yields.

Analysis of Coal used in TABLE A *Experiments.*

—	Natural Basis.	Ash and Water Free Basis.
	P.Ct.	P.Ct.
Volatile matter (American test)	33·5	..
Ash	5·13	..
Moisture	1·42	..
Calorific value, B.Th.U. per lb.	14,460	..
Ultimate analysis—		
Carbon	79·98	85·59
Hydrogen	4·73	5·06
Nitrogen	1·22	1·31
Sulphur	1·69	1·81
Oxygen	5·83	6·23

TWO-STAGE DISTILLATION.

As the first of these observations appeared to be contrary to our preconceived ideas of carbonization, it was proposed to carry out the carbonization in two stages, for the purpose of ascertaining whether this more careful method of carbonization would still give a low yield of volatile therms. Table B shows the results thus obtained.

In these tests the same type of coal and the same apparatus were used as in the first series of carbonizations. Carbonization was, however, effected in two stages, a temperature of 525° C. being taken as the first stage. This temperature was maintained until no further volatile matter was expelled, and the residue was then heated up to 1000° C., to complete carbonization. The preliminary temperature of 525° C., as well as the final temperature of 1000° C., was attained in varying times in the three experiments. From these experiments it will be seen that this two-stage distillation process is obviously a more careful—*i.e.*, a less drastic—carbonizing process. It is less drastic in that there is obtained an abnormally high yield of tar, very little carbon and pitch, and a yield of gas therms which is quite poor when considered in the light of to-day's working results. It will be observed that the percentage of unsaturated hydrocarbons in the final gas is low.

The total yield of volatile products is, however, of the same order as the yields obtained in the moderately slow carbonizations of the first series of experiments. It is a remarkable fact that under these conditions of careful working such a low yield is obtained, but this observation forms the basis of important conclusions to be developed subsequently. The first hypothesis which was suggested to explain the results obtained was that some molecular rearrangement of the coal substance itself had taken place under these conditions, and at a moderately low temperature, before true carbonization had commenced, and that on this account the coal became less suitable for gas manufacture. The author is, however, now convinced that a very much simpler explanation of this phenomenon lies in the suggestion that when the coal is very slowly distilled there occurs simultaneously a fractional distillation of the tar, with the consequent formation of pitch. An observation which tends to confirm this hypothesis is that the tar obtained is a limpid brown liquid containing a very small proportion of pitch and practically no free carbon, and, when the carbonization process is very protracted, it is comparatively small in quantity. Further, such a hypothesis would account for the considerably augmented coke yield, as well as for the increase in the quantity of pitch and carbon found in the retort, which otherwise would be inexplicable after such special precautions had been taken to carry out a very careful distillation of the coal. There is much more evidence to support this hypothesis, which will be presented at a later stage.

The second important conclusion which resulted from a study of the first series of experiments will now be considered—*i.e.*, that the more rapid the carbonization the greater the thermal yield of gas. It is evident that the additional gas produced during rapid carbonization results principally from the cracking of tar within the retort. This decomposition of the tar is at its maximum in the case of the most rapid heating, as may be seen also from an examination of the nature of the gas produced. The most outstanding characteristic of the gas is the high proportion of unsaturated hydrocarbons—a fact which points to the decomposition of tar. It is of interest to note, however, that tar cracking—to the extent to which it is practised in these experiments—appears to proceed without any appreciable loss in

TABLE B.—*Two-Stage Carbonizations of Coal* (100 *Grammes Typical Durham Coal, Briquetted*).

yields.

percentage of unsaturated hydrocarbons in the final gas is low.

cracking—to the extent to which it is practised in these experiments—appears to proceed without any appreciable loss in

TABLE B.—*Two-Stage Carbonizations of Coal* (100 *Grammes Typical Durham Coal, Briquetted*).

Number of Experiment.	Time			Yields of Products per Ton of Coal.						P.Ct. Volatile Matter in Coke.	P.Ct. Composition of O_2 and N_2 Free Gas.					Calorific Values of Products (Gross).			Distribution of Heat Units in Products						Process Yield of Therms.	
																			Therms per Ton of Original Coal.							
	to 525° C.	at 525° C.	525° to 1000° C.	Coke.	Tar.	O_2 and N_2 Free Gas.*	Liquor.	Carbon and Pitch.	Total as P Ct. Original Coal.		CO_2.	C_nH_m.	CO.	CH_4.†	H_2.	O_2 and N_2 Free Gas. B.Th.U. per C.Ft	Coke. B.Th.U. per Lb.	Tar. B.Th.U. per Lb.	Coke.	Tar.	Gas.‡	Carbon and Pitch.	Total Volatile Therms.	Total Non-Volatile Therms.	Per Ton of Coal.	P Ct.
	Mins.	Hours.	Mins.	Cwt.	Galls.	C.Ft.	Galls.	Lbs.																		
1. . . .	6	1½	20	13·6	17·9	11,690	14·8	11·2	98·5	0·46	2·3	2·7	9·2	28·6	57·2	563	13,290	14,075	202·5	27·7	67·3	1·6	95·0	204·1	299·1	92·4
2. . . .	6	1½	25	13·6	16·8	12,290	13·9	15·7	97·5	0·87	2·1	2·2	10·2	25·2	60 3	532	13,500	14,560	205·0	27·0	66·9	2·3	93·9	207·3	301·2	93·0
3. . . .	8	6	9	13 6	16·7	11,940	13 8	17 9	97·5	0·47	1·9	2·3	7 8	27·8	60·2	552	13,460	14,240	205·0	26·4	67·5	2·6	93·9	207·6	301 5	93·0

Gas Fractions from Two-Stage Carbonizations (*Experiments* 1, 2, *and* 3 *above*).

Number of Experiment.	Fraction up to 525° C. (O_2 and N_2 Free).								Fraction 525° to 1000° C. (O_2 and N_2 Free).								Complete Gas (Mixed Fractions) O_2 and N_2 Free.							
	P.Ct. Composition.					Yield per Ton C.Ft.	C.V. B.Th.U. per C.Ft.	Therms per Ton.	P.Ct. Composition.					Yield per Ton C.Ft.*	C.V. B.Th.U. per C.Ft.	Therms per Ton.‡	P.Ct. Composition.					Yield per Ton C.Ft.*	C.V. B.Th.U. per C.Ft.	Therms per Ton.‡
	CO_2.	C_nH_m.	CO.	CH_4.†	H_2.				CO_2.	C_nH_m.	CO.	CH_4.†	H_2.				CO_2.	C_nH_m.	CO.	CH_4.†	H_2.			
1. . . .	7·4	10·25	4·85	77·5	..	950	1042	9·9	1·8	2·0	9·7	24·2	62·3	10,740	520	57·4	2·3	2 7	9·2	28·6	57·2	11,690	563	67·3
2. . . .	5·9	8·0	6·7	68·6	10·8	1370	936	12·8	1·6	1·4	10·6	19·5	66·9	10,920	482	54·1	2·1	2·2	10·2	25 2	60·3	12,290	532	66·9
3. . . .	6·2	8·25	5·85	67·1	12·6	1500	930	13·9	1·3	1·5	8·1	22·1	67 0	10,440	499	53·6	1·9	2·3	7·8	27·8	60·2	11,940	552	67·5

All gas measurements are made at 60° Fahr. and 30 in.

* This does not include residual gas in retort. † CH_4 includes ethane and other saturated hydrocarbons. ‡ A correction of + 1·5 therms per ton for residual gas in retort and other apparatus has been applied.

therms, for it will be seen from Table B that, for all practical purposes, it may be said that the therms lost from the tar are approximately recovered in the gas. These results dispose of the objection to horizontal-retort working which has been put forward by those interested in promoting a slow and more careful method of distillation. This objection is founded upon a belief which the author knows to be mistaken—viz., that the rapid heating of coal is very wasteful of thermal energy.

The outstanding conclusion to be drawn from this work is that there is a tendency for the highest volatile therm yield to be obtained by practising the most rapid heating possible; and, while such a condition is certainly conducive to high gaseous therm yields, slower and more careful distillation is a tar-conserving process, and exceedingly slow distillation a coke-conserving one. Beyond this, the work is only of academic interest, as the conditions of these experiments are not directly comparable with large-scale working of to-day. The excellent results obtained in these experiments are explicable, and have formed the basis of further investigations of the principles of obtaining enhanced yields of volatile therms.

PROFITABLE TAR CRACKING.

Returning to the important question of the extent to which tar may be profitably cracked into gas, certain chemical aspects of the mechanism of tar cracking should be presented. By this means it is possible to demonstrate that there is a certain limit to the quantity of gas which may be produced from tar, the overstepping of which limit results in the deterioration of the tar to such an extent that the process becomes untenable from many points of view. It is almost unnecessary to explain that in the production of gas at the expense of tar—which is proceeding to a

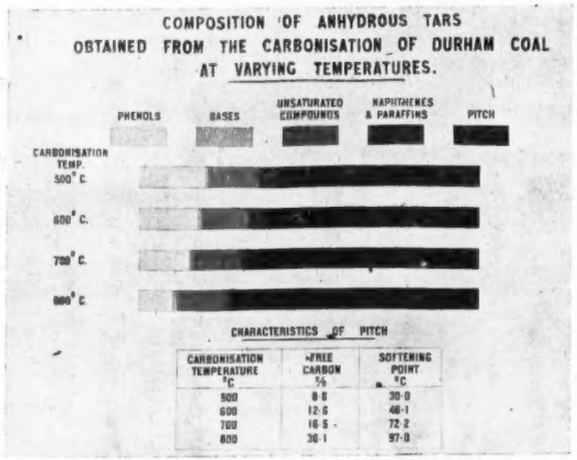


Fig. 6.

varying extent at all stages of coal-distillation—it is not a certain proportion of the tar which is changed into gas, leaving the remainder unchanged, but the character of all the tar is entirely altered, as regards both its physical properties and chemical constitution. The brown limpid fluid obtained under conditions of slow heating is replaced under the conditions of rapid heating and high temperatures by a thick black tar which becomes more and more viscous with increasing decomposition. These points are very well developed in fig. 6, which shows the analyses of tars obtained from the carbonization of a Durham coal at increasing temperatures. It is apparent that with increasing temperatures the naphthenes, paraffins, and phenols gradually disappear, while the pitch content is appreciably augmented. Another point of considerable interest, which may be seen from the table in that diagram, is the degree of decomposition which has taken place in the pitch, as exemplified by its free carbon content, which is 8·6 p.ct. in 500° C. tar, and as much as 36·1 p.ct. in 800° C. tar.

The tar obtained from quite a low-temperature distillation may now be regarded as primary, and that from a high-temperature distillation as secondary. Investigations are proceeding at the present moment into the constitution of these primary tars, and some of the work is leading to such interesting conclusions, and would form such a delightful subject-matter for lectures, that the author has almost been tempted to incorporate some of it in the present series. There is, however, little satisfaction in presenting the work of others, and it is proposed only to refer, therefore, to the recent work of Frantz Fischer and his collaborators upon the constitution of phenols of high and low temperature tars. This

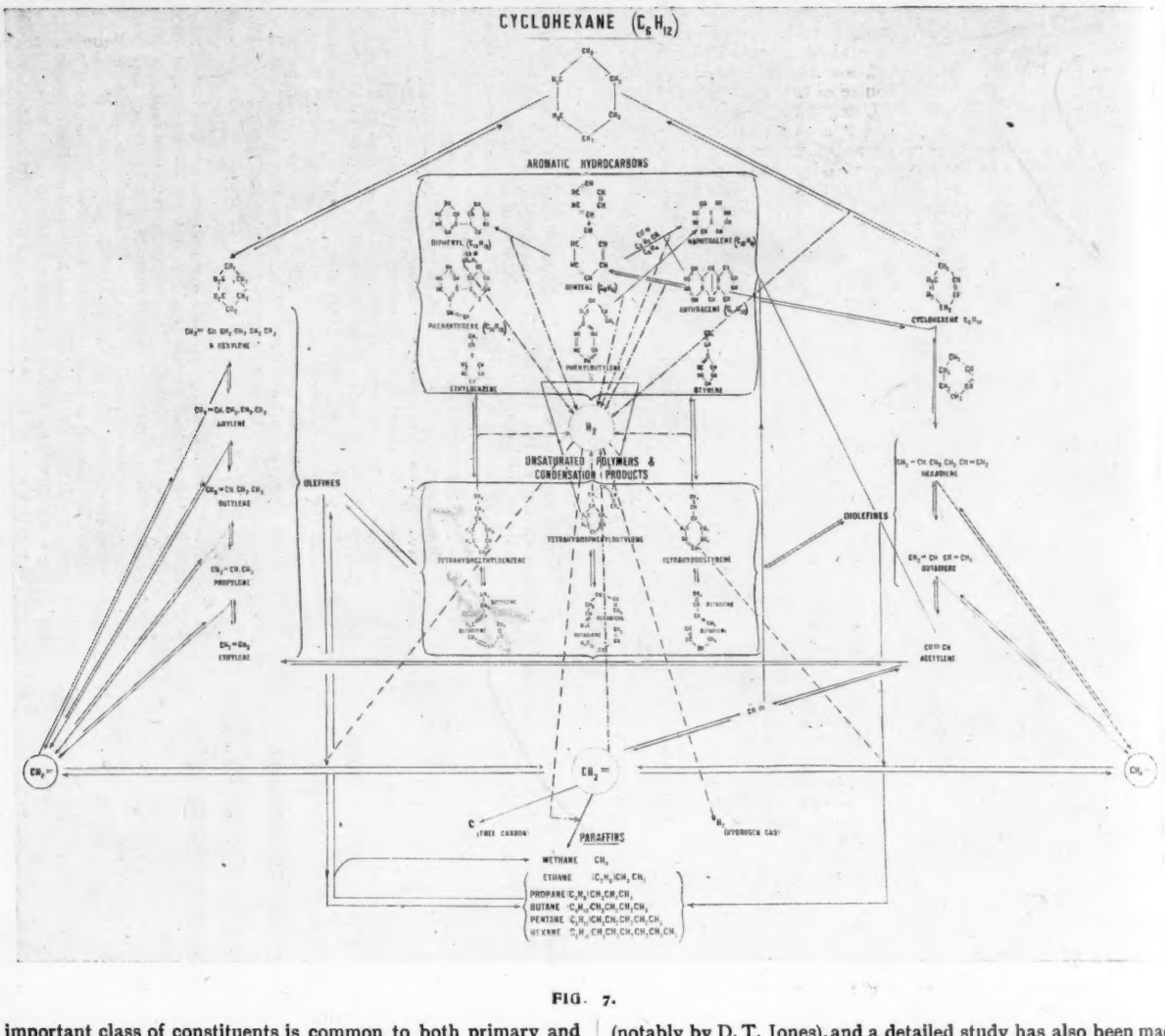
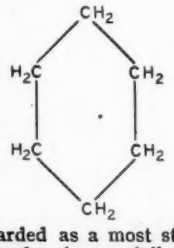


FIG. 7.

important class of constituents is common to both primary and secondary tars, but their individual members are markedly different in the two cases, and their study presents much fascination to those attempting to interpret the carbonizing process.

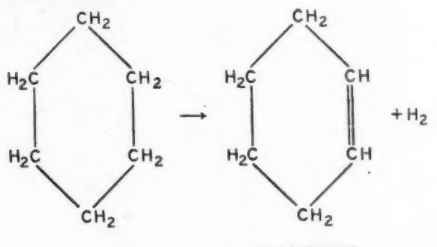
CONSTITUTION OF PRIMARY TAR AND DECOMPOSITION OF CYCLOHEXANE.

The most important class of compounds present in primary tar consists, as first shown by Pictet and his collaborators, of hydrocarbons of the closed-ring type similar to those found in petroleum. They may be either fully saturated, as cyclohexane (C_6H_{12}), or only partly saturated, as cyclohexene (C_6H_{10}); and in order to attempt to trace the mechanism of tar cracking it is proposed to consider in detail the effect of heat upon these two hydrocarbons, which may be regarded as typical of other members of the same series. The cracking of cyclohexane forms a very interesting picture of the complicated nature of the multitudinous reactions which take place in the thermal decomposition of a primary tar. Complex though the reactions are, they are not so complex as in the case of the decomposition of phenols by heat, for cyclohexane only contains atoms of carbon and hydrogen in the molecule, while the phenols possess also one or more oxygen atoms. In the case of cyclohexane, the six carbon atoms in the molecule are linked together in the form of a ring, each carbon atom being attached to two other carbon atoms and two hydrogen atoms. It is hexahydrobenzene, C_6H_{12}.



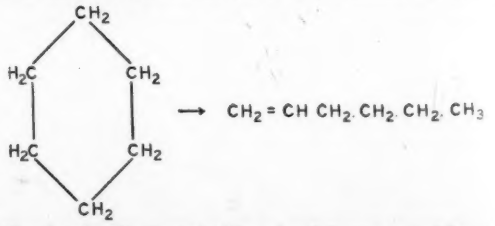
This is usually regarded as a most stable grouping, and, in fact, cyclohexane is found to be specially resistant to attack by most chemical reagents, Resistant though it may be to chemical attack, the molecule becomes very unstable at high temperatures, and from this one chemical compound there may originate innumerable compounds, solid, liquid, and gaseous. The thermal decomposition of cyclohexane has been studied by several workers (notably by D. T. Jones), and a detailed study has also been made by the author of the liquid and gaseous products of decomposition. This experimental work has formed the basis of a diagram representing the course of decomposition of this hydrocarbon; and though some of the reactions indicated may be hypothetical, they are based as far as possible on facts supported by experimental evidence. The object of presenting this imaginative picture is to allow some small appreciation of the innumerable reactions likely to take place in a retort at any one moment.

A large number of the possible reactions which may be conceived to take place in the decomposition of cyclohexane by heat are grouped together in fig. 7. The decomposition appears to commence either with the elimination of hydrogen, forming the compound cyclohexene,



CYCLOHEXENE.

or, by direct fission of the ring, when molecular rearrangement will take place, resulting in the formation of an open-chain hydrocarbon of the unsaturated type, as, for example, the olefine n.hexylene.



[A film showing the decomposition of cyclohexane to cyclohexene and to n.hexylene was thrown on the screen.]

The two reactions proceed simultaneously, and probably with similar velocities. The two products of decomposition, n.hexylene and cyclohexene, may undergo further decomposition on heating. In the first place, the possible course of the decomposition of the n.hexylene may be considered. Using the conception of ($CH_2=$) residues originated by Prof. Bone, it may be imagined that this hypothetical group becomes separated from the rest of the molecule by a breaking of the double bond—a special point of weakness in the molecular structure—and that the remaining portion then undergoes rearrangement, with the formation of the lower olefine, amylene.

$$CH_2=CH.CH_2.CH_2.CH_2.CH_3. \rightarrow CH_2=CH.CH_2.CH_2.CH_3 + (CH_2=)$$
Amylene

[*This reaction was illustrated by a film.*]

Amylene itself may similarly be decomposed with the formation of butylene; and this in turn may give rise to propylene and then to ethylene. Ethylene may finally decompose into two ($CH_2=$) groups.

$$CH_2=CH.CH_2.CH_2.CH_3 \rightarrow CH_2=CH.CH_2.CH_3 + (CH_2=)$$
Butylene

$$CH_2=CH.CH_2.CH_3. \rightarrow CH_2=CH.CH_3 + (CH_2=)$$
Propylene

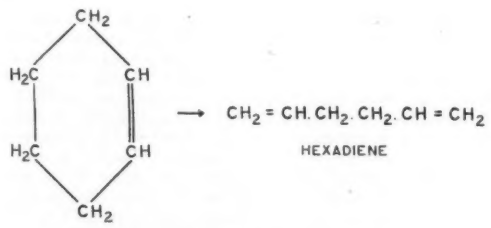
$$CH_2=CH.CH_3 \rightarrow CH_2=CH_2 + (CH_2=)$$
Ethylene

$$CH_2=CH_2 \rightarrow (CH_2=) + (CH_2=)$$

It should be pointed out at this stage that these ($CH_2=$) residues would be too unstable to exist as such; they would necessarily be very reactive, and become involved in other reactions which will be mentioned later. They are, however, especially useful, as Bone has previously shown, in constructing a picture of the mechanism of hydrocarbon decomposition.

Returning to cyclohexene—the primary product in the alternative method of decomposition of the original cyclohexane—this compound cannot resist further decomposition, owing to the presence of the double bond. The major portion, through fissure of the ring at the double bond, and rearrangement of the molecule, is converted to open-chain unsaturated compounds. The initial product is probably the diolefine hexadiene, and this may be expected to undergo further decomposition, splitting off ($CH_2=$) residues, and giving rise in turn to butadiene, and finally acetylene.

[*A film depicting the decomposition of cyclohexene to hexadiene was shown.*]



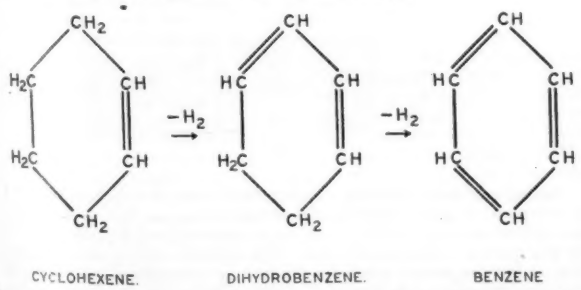
$$CH_2=CH.CH_2.CH_2.CH=CH_2 \rightarrow (CH_2=) + CH_2=CH.CH=CH_2 + (CH_2=)$$
Butadiene

$$CH_2=CH.CH=CH_2 \rightarrow (CH_2=) + CH\equiv CH + (CH_2=)$$
Acetylene.

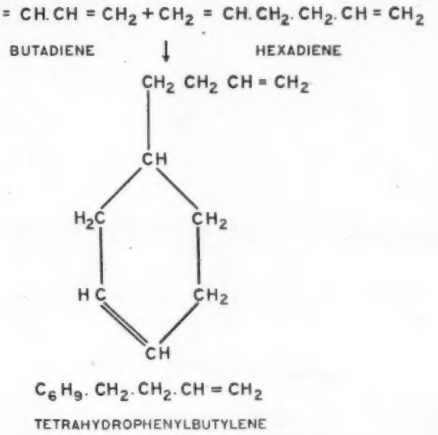
The acetylene may then break down either to the hypothetical ($CH\equiv$) residues, or finally to carbon and hydrogen.

$$CH\equiv CH \rightarrow (CH\equiv) + (CH\equiv)$$
$$CH\equiv CH \rightarrow 2C + H_2$$

A smaller portion of the cyclohexene undergoes loss of hydrogen, resulting ultimately in the formation of benzene. Dihydrobenzene possibly represents a transition stage.



Simultaneously with the other reactions already described, it would appear that some polymerization and condensation of the unsaturated molecules take place, resulting in the formation of high boiling-point unsaturated bodies and aromatic compounds. For example, it is possible to conceive that butadiene and hexadiene may unite to produce tetrahydrophenylbutylene,



which on dehydrogenation may give phenylbutylene.

$$C_6H_9.CH_2.CH_2.CH=CH_2 \rightarrow C_6H_5.CH_2.CH_2.CH=CH_2 + 2H_2$$
phenylbutylene.

This compound is well known to be capable of condensing to naphthalene, with the elimination of hydrogen.

$$C_6H_5.CH_2.CH_2.CH=CH_2 \rightarrow C_{10}H_8 + 2H_2.$$

[*A further film showed the formation of naphthalene from butadiene and hexadiene.*]

Before leaving the olefines already referred to, it must be pointed out that these may be hydrogenated to paraffins. A glance at fig. 7 will indicate that there is always present for this purpose sufficient hydrogen produced during the reactions of decomposition. In this way, hexylene may be converted to hexane, and, similarly, pentane, butane, propane, and ethane may be formed from their corresponding unsaturated hydrocarbons.

$$CH_3.CH_2.CH_2.CH_2.CH=CH_2 + H_2$$
Hexylene
$$\rightarrow CH_3.CH_2.CH_2.CH_2.CH_2.CH_3$$
Hexane

A reverse change may, however, take place, resulting in the formation of methane and an olefine containing one carbon atom less than the original paraffin. For example, hexane may give rise to amylene and methane.

$$CH_3.CH_2.CH_2.CH_2.CH_2.CH_3 \rightarrow CH_2=CH.CH_2.CH_2.CH_3 + CH_4$$
Amylene Methane

The hypothetical ($CH\equiv$) and ($CH_2=$) residues which have been assumed to be produced at various stages of the decomposition, together with a considerable quantity of hydrogen, may undergo interaction or decomposition, with the formation of compounds such as the following:

(*a*) Methane
$(CH_2=) + H_2 \rightarrow CH_4$

(*b*) Ethylene
$(CH_2=) + (CH_2=) \rightarrow CH_2=CH_2$

(*c*) Acetylene
$(CH\equiv) + (CH\equiv) \rightarrow CH\equiv CH$

(*d*) Benzene
$6(CH\equiv)$ or $3\,CH\equiv CH \rightarrow C_6H_6$

(*e*) Naphthalene
$C_6H_6 + 4(CH\equiv)$ or $2CH\equiv CH \rightarrow C_{10}H_8 + H_2$

(*f*) Carbon and Hydrogen
$(CH_2=) \rightarrow C + H_2$

The relative proportions in which these various decomposition products are present will be considerably influenced by the temperature at which the cracking takes place. The accompanying diagram (fig. 8) shows approximately the relative proportions of the important products formed at three different temperatures, 650°, 700°, and 750° C. It will be noted that the proportions of free carbon and gas increase with the temperature, while the liquid decomposition products become more aromatic in character. The insignificant amount of benzene produced calls for attention. When the temperature is sufficiently high, complete degradation to carbon and hydrogen may take place. From this picture it is evident that a whole series of both analytical and synthetical reactions are in progress during the decomposition of cyclohexane by heat. When it is realized that, in the first place, cyclohexane is not nearly so complex as most of the other constituents of primary tar, and, secondly, that it is only one of the innumerable compounds present in that tar, no apology will be required

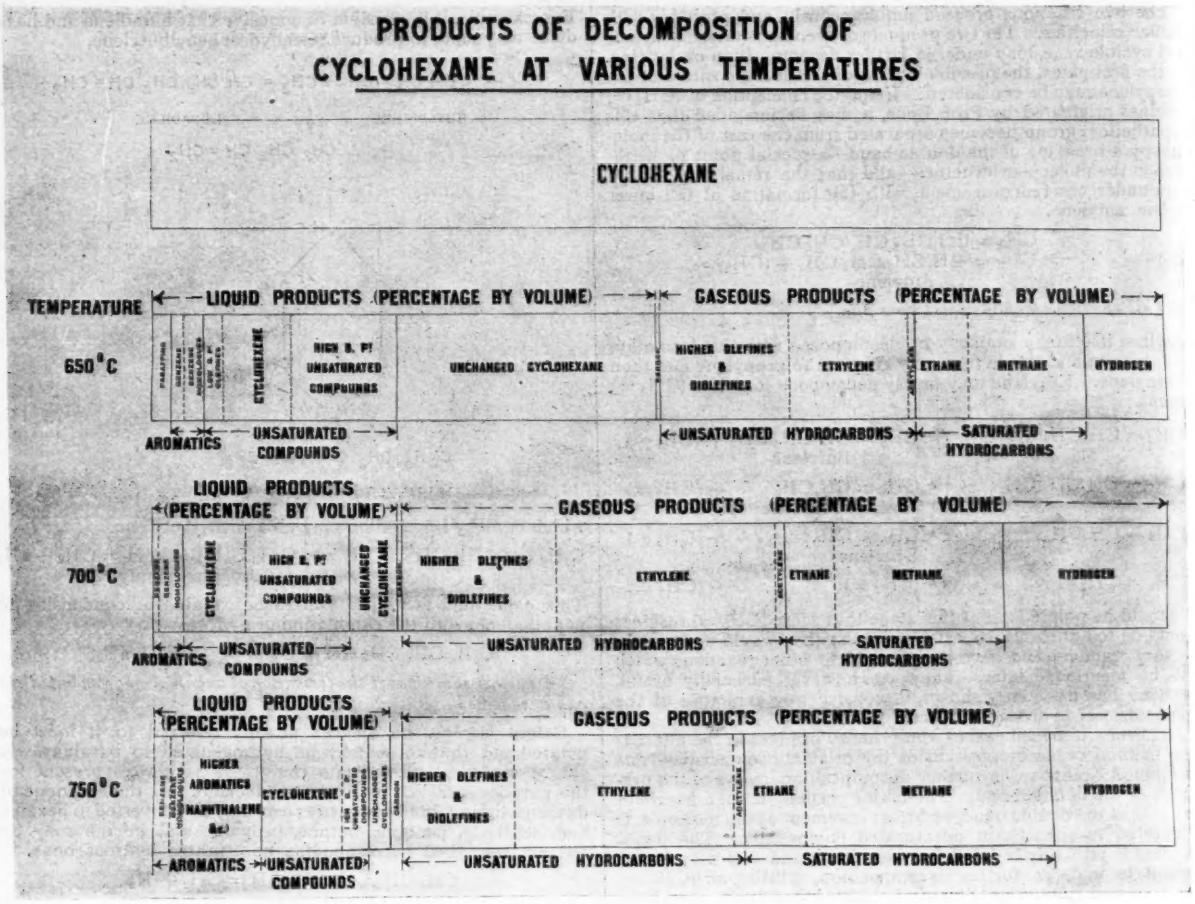


FIG. 8.

from the chemist for his inability to gain anything but the haziest notion of what is taking place in the retort.

Conclusions Drawn from Experiments.

Our experiments, though perhaps indicating a slightly different interpretation of the mechanism of cracking of cyclohexane from that suggested by other investigators, lead to the same general conclusions:

(1) Hydrocarbons of the cyclohexane and cyclohexene type are the main gas-yielding constituents of primary tar. The gas resulting from their decomposition is rich in unsaturated compounds, together with ethane and methane, and is consequently of high calorific value.

(2) The higher aromatic compounds, such as naphthalene, anthracene, &c., are formed to an appreciable extent by the polymerization and condensation of the unsaturated compounds present in the gaseous decomposition products.

(3) Direct dehydrogenation, with the formation of benzene and its homologues, takes place only to a very small extent, insufficient to account for the quantity of these compounds present in high-temperature tar.

Cracking of Primary and Secondary Tars.

It will have been seen that cyclohexane lends itself admirably to the cracking process, and it is probable that the gas industry depends greatly upon the cracking of hydrocarbons of this type for the production of gas sufficiently rich to allow the subsequent admixture of water gas without unduly lowering the calorific value below that requisite for economic distribution. It is probable that such hydrocarbons as cyclohexane are selectively cracked in the decomposition of primary tar, leaving a residue of secondary tar which is less suitable for further cracking. This question of the cracking of primary and secondary tars has been studied in a series of experiments in which high and low temperature tars have been cracked in a somewhat artificial way in the laboratory. In these experiments high and low temperature tars have been heated to various temperatures, the tar vapours being cracked over heated coke in the presence of nitrogen or coal gas. Though the results of these experiments are presented, it is beyond the wit of man to interpret the results obtained in terms of the actual chemical reactions which have taken place.

The apparatus used is illustrated in fig. 9. Into a silica tube 36 in. long, heated by two separate furnaces at different points of its length, were placed a boat containing 10 grammes of tar to be heated by one furnace, and a quantity of coke, a short distance from it, to be heated by the other furnace and to act as a heated contact material for the cracking of tar. A stream of nitrogen or coal gas was passed slowly through the tube from the tar boat end, the gases and condensable liquids being conducted away from the opposite end. The method of procedure was first to heat the coke to a definite temperature; and, this having been done, the contents of the boat were heated to a similar temperature over a period of either two or four hours. Representative samples of high and low temperature tars were used in these experiments, and the results obtained are indicated in Tables C and D. It will be readily appreciated that the conditions of these experiments are very dissimilar to those which may take place during the cracking of tar in the carbonization process on a large scale. Notwithstanding this, the results are of considerable interest.

FURNACE USED IN TAR CRACKING EXPERIMENTS.

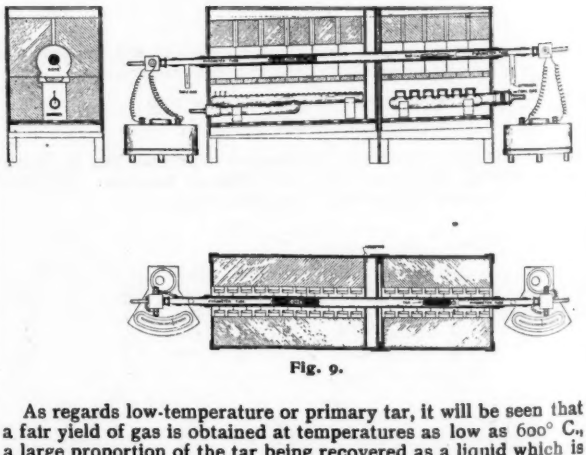


Fig. 9.

As regards low-temperature or primary tar, it will be seen that a fair yield of gas is obtained at temperatures as low as 600° C., a large proportion of the tar being recovered as a liquid which is of the nature of secondary tar. The figures relating to the quantity of tar recovered refer only to the tar condensed, and do not include the residue in the boat. The residue obtained in the case of low temperature decomposition was a pitchlike coke, while that remaining at higher temperatures was virtually a coke containing practically no volatile matter. The yield of gas and tar recovered at this temperature is of the order of 62 to 74 p.ct., whereas at

TABLE C.—*Cracking of High-Temperature Tar* (10 *Grammes*).

Temperature of Heated Coke.	Duration of Experiment.	Volume of Gas (O_2 and N_2 Free).	P.Ct. by Weight of Recovered Liquid and Gaseous Products.			P.Ct. Composition of Gas (O_2 and N_2 Free).					Calorific Value (calculated) O_2 and N_2 Free Gas B.Th.U. per C.Ft.	Gas Yield as P Ct. of Therms in Original Tar.
			Tar.†	Gas (calculated).	Total.	CO_2.	Unsaturated C_nH_m.	CO.	CH_4.‡	H_2.		
	Hours.	c.c.	P.Ct.	P.Ct.	P.Ct.							
1000° C. Expt. *a*	2	6520	4·2	17·3	21·5	1·3	0·0	8·7	10·2	79·8	384	25·8
1000° C. ,, *b*	2	5505	5·8	14·2	20·0	0·7	0·1	6·9	14·0	78·2	414	23·5
900° C. *Expt. *a*	2	4180	18·7	14·1	32·8	1·2	—	10·0	18·6	70·2	440	19·0
900° C. ,, *b*	2	4360	28·0	12·6	40·6	1·0	—	11·6	9·6	77·8	381	17·1
800° C. Expt. *a*	4	3380	28·9	11·4	40·3	1·7	0·6	7·3	22·2	68·2	476	16·5
800° C. ,, *b*	2	3080	28·3	10·1	38 4	2·1	0·7	6·0	21·2	70·0	470	14·9
800° C. ,, *c*	2	2735	30·5	9·5	40 0	1·6	0·8	6·6	24·6	66·4	497	14 2
800° C. ,, *d*	1	1325	51·0	5·8	56·8	2·8	1·8	8·0	30·7	56·7	556	7·6
700° C. *Expt. *a*	2	1502	34·2	5·4	39·6	2·6	—	5·0	29·4	63·0	508	7·9
700° C. ,, *b*	2	1306	34·3	5 6	39·9	1·3	2·6	7·9	31·4	56·8	584	7·8
600° C. Expt. *a*	2	762	51·3	3·3	54·6	5·6	3 6	6·6	33·1	51·1	603	4·7
600° C. ,, *b*	2	460	54·0	2·0	56·0	2 2	—	4·1	43·7	50·0	606	2·9

All gas measurements are made at 60° Fahr. and 30 in.

* Experiments conducted in an atmosphere of coal gas, nitrogen being used in remaining experiments. † Only approximate figures.

‡ CH_4 includes ethane and other saturated hydrocarbons.

TABLE D.—*Cracking of Low Temperature Tar* (10 *Grammes*).

Temperature of Heated Coke.	Duration of Experiment.	Volume of Gas (O_2 and N_2 Free).	P.Ct. by Weight of Recovered Liquid and Gaseous Products.			P.Ct Composition of Gas (O_2 and N_2 Free).					Calorific Value (calculated) O_2 and N_2 Free Gas B.Th U. per C.Ft.	Gas Yield as P.Ct. of Therms in Original Tar.
			Tar.†	Gas (calculated).	T otal	CO_2.	Unsaturated C_nH_m.	CO.	CH_4 §	H_2.		
	Hours.	c.c.	P.Ct.	P.Ct.	P.Ct.							
980° C.	2	8800	8·0	28·9	36·9	0·8	0·5	12 2	13·4	73·1	418	38·0
970° C.	2	9000	13 8	31·1	44·9	1·0	0·4	15·0	13·3	70·3	414	38·8
900° C. Expt. *a*	4	6000	20 4	27·5	47·9	1·8	1 0	12·6	31·1	53·5	545	33·8
900° C. ,, *b*	2	5960	24·0	26·2	50·2	1·2	1·7	10·2	32·1	54 8	570	35·1
800° C. Expt. *a*	4	5725	27·4	27·5	54·9	1·6	1·8	12·3	33·7	50·6	581	34·2
800° C. ,, *b*	2	4980	35·0	23·9	58 9	0·7	2·3	12·2	34·9	50·0	595	30·6
700° C. Expt. *a*	4	3965	36·2	21·6	57 8	1·2	2·6	12·3	43·1	40·8	664	27·2
700° C. ,, *b*	2	2590	56 6	16·3	72·9	2·2	9·0	9·2	50·4	29·2	847	22 6
600° C. Expt. *a*	4	2470	49·2	13·6	62·8	1·4	8·1	8·2	49·9	32·4	830	21·2
600° C. ,, *b*	2	1830	60·1	14·0	74·1	2·7	13 0	6 9	56·3	21·1	972	18·3

All experiments conducted in an atmosphere of nitr gen. All gas mea surements are made at 60° Fahr. and 30 in.

† Only approximate figures. § CH_4 includes ethane and other saturated hydrocarbons.

800° C. the yield is less satisfactory. At 980° C. the process has already become poor from the point of view of total yield—the efficiency of cracking to tar and gas having been reduced to 30 to 40 p.ct. The quantity of tar recovered at this temperature is very small, and it is of an inferior quality, being thick and viscous. Moreover, it is evident from the gas analyses that with increasing temperatures the gas itself has suffered considerable deterioration, the hydrocarbons having been largely decomposed, and the hydrogen percentage materially increased. The gas made at the lower temperatures is rich in saturated and unsaturated hydrocarbons, and poor in hydrogen. The vital necessity of clearing the rich gas from the retort as quickly as possible, and avoiding long contact with heated surfaces, is clearly demonstrated in the experiment at 700° C., where an extension of the duration of the experiment from two to four hours results in a considerable degradation of the gas; the unsaturated hydrocarbons alone having decreased from 9 to 2·6 p.ct.

In dealing with the results obtained from the cracking of high-temperature tar, it will be seen that the yields by weight of gas and tar at 1000° C. only amounted to 20 p.ct., while only 25 p.ct. of the thermal value of the tar was recovered as gas—and very poor gas too. But, above all, it should be noted that the residual tar obtained by this procedure was little else than free carbon. In all cases of the cracking of this high-temperature tar the gas consists mainly of hydrogen. Only a small percentage of unsaturated hydrocarbons is present, and methane is also a much less important constituent than in the gas from low-temperature tar.

The conclusion that should be drawn from these experiments is that, directly a primary tar has been converted by cracking to a secondary tar, it should be removed from the retort as quickly as possible, as the high-temperature tar is a most unsuitable material to be submitted to the cracking process. The compounds present in high-temperature tar are comparatively stable, having resulted from the decomposition of less stable bodies, and are only decomposable at the highest temperature of carbonization. They decompose mainly by the elimination of hydrogen, and the formation of compounds of increasing molecular complexity, and it would appear that the process ends finally with the formation of carbon itself. It has been suggested that, in view of the production of carbon from dehydrogenation of complex hydrocarbon molecules, the structure of the carbon molecule itself is far from simple. The yield of gaseous therms obtainable from such a tar is very limited, and can only be attained by sacrificing at considerable loss valuable constituents such as benzene and its homologues, thus rendering the tar of little value as an industrial commodity.

Before leaving the consideration of these experiments, it should be noted from these results, and also from those shown in Tables A and B, that the nature of the gas obtained during carbonization is indicative of the nature of the reactions taking place in the retort. The greater the percentage of unsaturated hydrocarbons in the gas, the greater the quantity of primary tar which has been converted to high temperature tar and gas. On the other hand, a lower proportion of these hydrocarbons may mean that the gas and tar have been subjected to too long an exposure to heated surfaces.

The author is unable to draw a clearer picture of the process of tar cracking, but is sure that there is justification for supposing that the first products of high-temperature carbonization are similar to those of low-temperature working, owing to the fact that the heating of coal is a gradual process, however rapid it may be. Thus, a study of the cracking of low-temperature or primary tar gives some indication of the reactions likely to occur in the high-temperature process. Yields in actual practice are, in fact, likely to be superior to those obtained by artificially cracking primary tar, as that tar itself may have suffered some degree of decomposition before its recovery, whereas the primary tar obtained during the actual working of the high-temperature process is cracked, so to speak, *in statu nascendi*.

The most important conclusion to be drawn from this work is that the cracking of high-temperature tar must be an uneconomical process. The yields and quality of gas produced are poor, while the nature of the tar is so degraded that it is practically valueless. When one commences to manufacture gas from high-temperature tar by the maintenance of very high temperatures or by allowing too great an exposure of the products of distillation to high temperatures, it is then that the thermal energy of the coal begins ruthlessly to be wasted.

ECONOMIC CONSIDERATIONS.

Having considered some of the chemical principles and the mechanism of tar cracking, the question now arises whether it is economical to replace tar by gas. This question of the economics of the distribution of therms per ton of coal carries with it a few problems of accountancy. Now the underlying principle of gas-works accountancy is that charges upon the undertaking, as well as revenues from all sales, including those from bye-products, shall be expressed wholly as a debit or

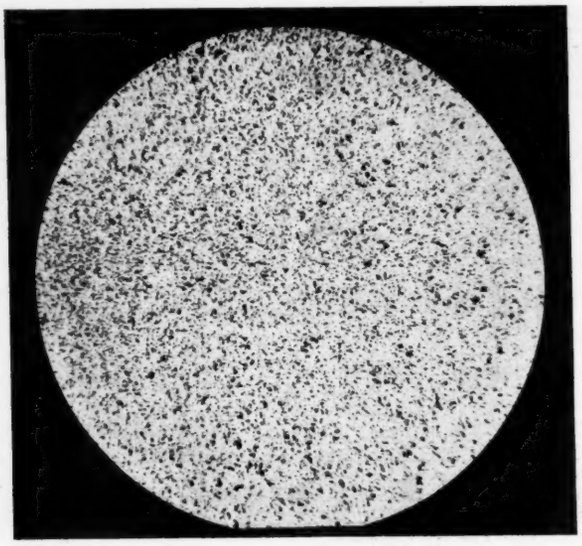


Fig. 10.

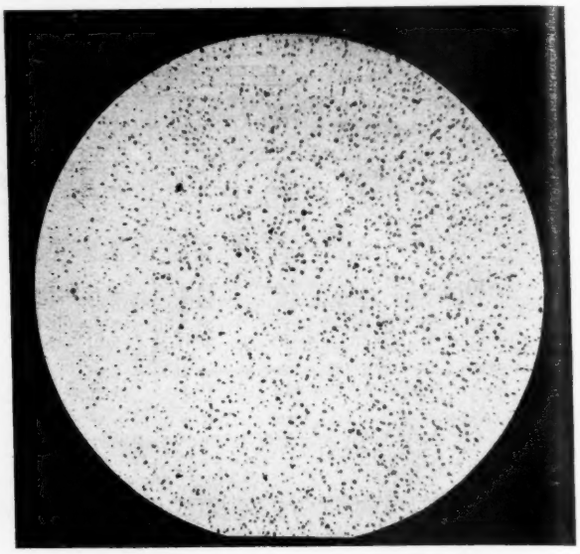


Fig. 11.

credit to the cost of gas manufacture; the revenue arising from the sale of coke, tar, ammonia, &c., being utilized for the purpose of reducing the selling price of gas. It is proper, of course, that this should be, as these subsidiary operations are carried out for the purpose of making and selling gas cheaply. But, for the purpose of computing the relative values of a therm in gas, tar, and coke, it is necessary to view the revenues from these products from a different perspective, and to cause each to bear its own cost of raw material and working expenses. The revenue from tar, both in the case of an undertaking possessing its own tar-works, and in those cases where tar is dehydrated or disposed of, is expressed as net revenue, after deducting all direct charges incurred in obtaining that revenue. The same applies to coke, and this method of gas-works accountancy causes tar and coke to be residuals in every sense of the word, for no contribution has been made by them for their share of the cost of the original coal, for expenses incurred in the retort-house, and, indeed, for the general overhead charges common to a gas undertaking. In order that the therms of the coal may be distributed in the most remunerative way, it is desirable that the accounts of the gas undertaking be analyzed, to show these points clearly. The author is not competent to deal with questions of accountancy, but for the purpose of examining the value of tar as tar, and tar converted to gas, the accounts of the three London Companies have been analyzed to show the contribution of *tar as tar*, and *tar as gas* in reducing the selling price of gas. In this way it will be possible to obtain a conception of the relative values of the gas therm and tar therm. The selling price of gas was therefore determined, assuming

(*a*) that the tar has no value and is thrown away,
(*b*) that the tar is sold as tar, and that its net revenue is deducted from the cost of gas manufacture (the usual practice), and
(*c*) that the therms of the tar are converted with 100 p.ct. efficiency into gas, allowance being made for the additional costs incurred in purification and distribution of the gas, but not for the cost of conversion of tar to gas.

The figures obtained from the balance-sheets of the London Companies are as follows:

Selling Price of Gas per Therm.

—	1920.	1921.	1922.	1923.
	Pence.	Pence.	Pence.	Pence.
Tar thrown away . .	11·8	12·7	11·3	9·6
Tar sold as tar . .	10·6	12·2	10·9	8·8
Tar sold as gas . .	10 1	10·9	9·7	8·2

It is thus seen that in the four years under consideration the contributions of *tar in the form of tar* to reducing the selling price of gas in the case of the London Companies are 1·2d., 0·5d., 0·4d., and 0·8d. per therm. Contrast with these figures the reductions in the selling price of gas which would have resulted had all the tar been converted into gas with 100 p.ct. yield and without incurring any process costs (except purification, distribution, &c.)—viz., 1·7d., 1 8d., 1·6d., and 1·4d. per therm. According to this basis, therefore, tar in the form of gas would appear to be 1·4, 3·6, 4·0, and 1·7 times as valuable as tar in the form of tar for the four years in question.

Now it is ridiculous to imagine that it is possible to convert all the high-temperature tar into gas with 100 p.ct. yield, but, provided the process of gasification of a part of the tar can be carried out with a high degree of efficiency, and provided the remaining tar does not realize a reduced market price per therm owing to this procedure, and that no additional retort-house costs are incurred particularly in regard to stopped pipes, then the process of gasification is an economical one, and should be practised. The degree to which tar gasification should be practised, however, is entirely dependent upon market conditions; and, from the figures given above, it would appear that in the years 1920 and 1923 it would not have been a paying proposition to gasify tar to any considerable extent. Unfortunately, to determine the wisdom or otherwise of gasifying tar under any conditions of market price, calculation and some experimental determinations are required which cannot conveniently be practised universally. For general purposes, however, it may be stated that, year in and year out, it is economically sound to gasify as much tar as possible, as long as troubles are not being experienced with stopped pipes in the retort-house, and the free-carbon content of the residual tar does not exceed 15 p.ct. (This figure is given as one above which serious deterioration and waste of secondary tar may result.)

It is not proposed to deal with the characteristics of high-temperature tar, but it may be of interest to note in passing that the free-carbon content of the tar is not only an indication of the amount of secondary decomposition that has taken place, but is also an indication of the ease with which the tar may be distilled at the tar-works.

A ready method of observing the free carbon content of tar is to produce a microscopic slide smudge. Fig. 10 represents a smudge obtained from horizontal-retort tar, and fig. 11 one from vertical-retort tar.

A tar possessing a high free-carbon content has the power to emulsify with water, and it becomes increasingly difficult to separate the water by distillation as the percentage of free carbon increases.

Practical Applications of Experimental Results.

It is now proposed to attempt to determine the practical applications of the experimental results and theoretical considerations submitted in this lecture. Large-scale experience, as well as the experimental work presented, demonstrates that the gas manufacturer who wishes to obtain a maximum gaseous thermal yield must practise the carbonization of coal as rapidly as possible. If two retorts of equal length and volume are taken, and in one 6 cwt. of coal are carbonized up to 1000° C. in 6 hours, and in the other 10 cwt. are carbonized up to the same temperature in 10 hours, then the rate of heating in the case of the small charge will be greater; and it is a recognized fact that the old method of 6-hour work and 6-cwt. charges gives better gaseous therm yields. This method of working, however, carries with it so many disabilities in the form of stopped pipes (the costs of which cannot be computed in terms of therms per ton), that the quest for gaseous therms must of necessity give way when stopped pipes and pitch troubles become acute. By increasing the weight of the charge, and the period of carbonization, the tendency is to preserve tar from being cracked, but there must come a stage when the tar yield is so high, and the gas yield so low, that means have to be taken for promoting the cracking process. Moreover, considerable difficulty is experienced in preventing the very fluid tar from refluxing in the ascension pipe, and the main disability of distilling 12 cwt. charges in 12 hours is the loss of tar at the mouthpiece, though means have now been adopted for obviating this loss. To-day the tendency in horizontal-retort working is to approach rapid carbonization by raising the temperatures of the setting so that the filled retort of coal may be carbonized in a smaller number of hours than the weight of the charge in cwts.—*i.e.*, 10 cwt. in 8 hours—13 cwt. in 11 hours, &c. This is the means now being adopted to obtain the most rapid carbonization in horizontal retorts without incurring the difficul-

ties of stopped pipes, and it is the way in which high gaseous therm yields are obtained. The tar yield naturally suffers slightly, and it is a question of economics whether this should or should not be. There will come a time when these newer weights and periods of carbonization will tend to produce the disadvantageous conditions of the light charge; the author does not know precisely where the transition point lies. With the manufacture of fireclay material of greater and greater fire-resisting and heat-transmitting properties, too great a degree of drasticity of distillation will tend to be reached, with the result that the limit of efficient working will be overstepped, and retort-house disturbances will be incurred. Further, it has been shown that the cracking of tar as it is being produced, or at the very instant after its production, differs appreciably from the cracking of secondary tar in a heated chamber. It follows from this that the cracking of tar in the coal substance is one thing, whereas the cracking of tar in the heated free space of a half-filled retort is an entirely different matter. The tendency of modern carbonizing practice in horizontal retorts is to reduce the free space to an absolute minimum, and the author is certain that this is advantageous to the distillation process. What is required, however, is greater rate of heat transmission within the coal substance, and this subject will be dealt with in the next lecture.

In conclusion, the author has demonstrated in one set of experiments the value of rapidly heating the charge. Rapid heating means the maintenance of high temperatures at the retort walls. In the second set, the folly of attempting to gasify secondary tar and even primary tar at high temperatures has been shown, and also of allowing the products of distillation to come into contact with highly-heated surfaces. Good carbonization is a fight between these two factors, and it is impossible to recommend any hard and fast rules of procedure to be adopted in the gas industry. Each gas undertaking is almost a law unto itself, governed by its existing plant, its geographical position, its markets for bye-products, and the requirements of its consumers. It has not been generally realized in the past that the conditions of carbonization can be readily modified in order to give the required distribution of therms, and to-day it is not a difficult matter for a chemist to determine the conditions likely to be most remunerative and satisfactory with the plant at the disposal of the engineer. Some of the hypotheses placed for your consideration may one of these days be found to be hopelessly unsound; but, even if this be the case, the main point of this lecture will still hold—viz., the inadequacy of thinking in terms of gaseous therms alone, and the necessity for considering volatile therms in the form of both tar and gas.

The author takes the opportunity of acknowledging the help afforded by Mr. E. Aston Dyer, who has prepared the film used for demonstrating some typical chemical changes. The large amount of work entailed has been undertaken by him in the belief that this method of depicting chemical reactions will play an important rôle in the teaching of chemistry in the future.

Treatment of Varnish by Gas.

Mr. Arthur M. Apmann deals fully, in the Jan. 5 issue of the "Gas Age-Record," with varnish cooking by surface combustion gas. The operation of varnish cooking requires great delicacy and watchfulness. In the past, varnish fires consisted of nothing more than circular holes in the ground, containing a fire grate, and below that an ashpit; the varnish kettle, on wheels, being rolled into position over the fire. With the surface combustion equipment described applied to the pit, it is possible by the turning of one valve to have the refractory bed at a white heat or a dull red, depending on the kind of work desired; and whether working fast or slow, a maximum efficiency of combustion is maintained, independent of the pit operator. In a comparison of actual operation of coke and gas, it was found that the gas-fire had cooked three kettles in 1¾ hours, while the coke fire had cooked one and partly cooked another. The average cost for coke was $11 per ton, with a consumption of 71 lbs. per kettle, making the fuel cost 39 cents per kettle. Three kettles of varnish were cooked with 1330 c.ft. of gas at a cost of 8 cents per 100 c.ft., making the cost per kettle 35·5 cents. Thus one gas-fire does the work of at least two coke fires, and the increased production of the varnish cooker more than offsets a fuel cost of 10 cents per kettle which may exist against gas because of higher rates, while the product is clean and uniform. Besides the ease of control and definiteness of operation, there are the low maintenance and repair costs of the refractory pits. Even after five years of daily operation, there are, the author says, gas pits with no maintenance charges against them. All in all, it again shows that gas, applied in the proper manner, is the ideal fuel for varnish cooking.

Eastern Counties Gas Managers' Association.—It has been arranged that the spring meeting of this Association shall be held at Gorleston, on May 7 and 8 next, under the presidency of Mr. E. F. Keable, Engineer and Manager of the Gorleston and Southtown Gas Company.

Natural Gas Supply.—In a pamphlet just issued by the United States Geological Survey, attention is drawn to the diminishing supply of natural gas, and the statement is made that "in many localities manufactured gas will undoubtedly replace natural gas, especially for domestic cooking, water heating, and similar uses."

THE USE OF TOWN GAS IN THE PRINTING TRADE.

[Extracts from a Paper by E. W. Smith, D.Sc., F.I.C., read before the Electrotypers' and Stereotypers' Association on Feb. 19.]

A year ago I described to you the principles which should be incorporated in any gas-furnace design, in order that satisfactory results might be attained in melting stereotype metal. At that time our first trial installation was working at Messrs. Cassells. Since then the work done by our Company (British Furnaces, Ltd.) in the printing trade in London has exceeded our expectations; and I am happy to think that we have given every satisfaction where our equipment has been installed. The success achieved has been due largely to the fact that most of the engineers in the printing trade have heartily co-operated with us. There have been instances where we have been approached in connection with our equipment by the "powers that be," who have not referred the matter to their engineers. In these cases we have had some difficulty in achieving the success claimed. In all cases we have shown a minimum saving of gas of 23 p.ct., and in many cases very much more than this. Gradually, the possibilities of our equipment are being recognized and more vitally appreciated.

There are now over thirty installations in twelve of the leading printing offices in London. Most of these installations have been laid under extremely difficult conditions; the conversion from previous methods to ours being carried out during the shut-down period over the week-end. The following is an account of some of the installations. I have not asked permission to refer to the names of any of the firms; and consequently I propose to refer to them by numbers.

(1).—This firm have already eight installations. (A) They are heating two "Winkler" automatic casting machines, having 1-ton pots; and three plates are being cast per minute, each plate weighing about 56 lbs. (B) There is a "Winkler" ingot caster for the linotype machines. (C) There is also a 30-cwt. round pot furnace for casting metal doing the same work as a junior autoplate machine holding 7½ tons. (D) There are two 1-ton square furnaces for ingot casting and plate work. (E) There is one 1-ton round furnace for plate casting. (F) There is one rectangular backing up pot. In all these installations low-pressure gas is used with air under 1 lb. pressure. Coal had previously been employed for this work; and we are informed by the engineer that the cost for gas is less than his previous cost for coal. These installations must have proved to this firm an enormous advantage over solid fuel, and the total savings must have been considerable.

(2).—This firm have a 1-ton round "Hoe's" plant for plate casting. It was previously heated by means of a high-pressure gas-burner; the gas being at 3 lbs. pressure. Our equipment for heating this furnace is of the high-pressure type, and we are employing gas at a pressure of 1½ lbs. The amount of gas being saved on this installation is over 20 p.ct.

(3).—This firm have installed one of our "C20" half-ton round pot furnaces, together with two special backing-up boxes for heating backing-up trays. These boxes have been specially designed, and are fixtures; each tray being separately heated. This system obviates the necessity of using the old type of rectangular pot. No lifting of the trays is necessary, and cooling is brought about by turning-off the gas and leaving the air on. This installation appears to be giving great satisfaction to the engineer, and he has duplicated the plant for one of his works in another part of the country. We are informed that the total gas now used on this installation is 45 p.ct. of the original consumption.

(4).—This company have two sets of "British Furnace" equipment on the 7½-ton junior autoplate machines.

(5).—This company have three installations of "British Furnace" equipment. Previously they had used coal for the same work.

(6).—This firm are heating a senior autoplate machine by means of a combination gas and oil burner. The burner is so designed that gas or oil may be used at will; the change-over from one form of fuel to the other being but a matter of seconds.

(7).—This company had previously heated their senior autoplate machine by means of gas. They had taken a considerable amount of interest in their equipment, and had carried out a lot of pioneer work in the development of improved methods of gaseous firing. They were recognized as having the most efficient gas-burning equipment in the London printing trade. For some time we found difficulty in showing any considerable advantage with our equipment, but subsequently satisfied the engineer that the saving amounted to about 21 p.ct.

(8).—This firm have one junior autoplate machine heated by means of "British Furnace" equipment, and one double junior autoplane machine. Coal was previously used as fuel.

(9).—This firm were the first to adopt our equipment in the printing trade in London. They have now one backing-up furnace, which was previously heated with gas. Our high-pressure gas burner equipment has been installed. There is one 18-cwt. furnace which was previously heated with gas. We have shown a saving in gas consumption of 33·3 p.ct. There is also a 2-ton pot furnace. Coal was previously used.

(10).—This company have two double junior autoplate ma-

chines of 11 tons capacity. Coal is used on their other installations. The equipment we have installed requires low-pressure gas, and air at 1 to 2 lbs. pressure.

(11).—The makers of the "Winkler" machines have adopted our method of gaseous firing.

(12).—This company have one "Winkler" ingot caster, equipped with "British Furnace" gas-burning equipment.

(13).—This company have two "Winkler" automatic casting machines, and one junior autoplate machine. Each of these is equipped with "British Furnace" burner equipment.

In very few places has it been possible to obtain accurate gas consumptions compared with previous fuel consumptions on similar work. Wherever such figures have been obtainable, we have shown a considerable saving of gas in all cases. Where gas is being compared with coal in the printing trade, we have shown on fuel alone that gas is cheaper than coal or coke. It is more difficult to compete with oil on fuel costs; but the advantages of gas over oil from the points of view of fire risks, oil storage, cleanliness, range of control of fuel consumption, &c., more than make up for any slight variations there may be in fuel costs. Gas has one definite advantage among many others—its price is practically stabilized; and any change there may be is in the direction of its reduction. Cheap oil certainly varies in quality.

Before leaving the subject of the use of gas in the printing trade, I should like to bring to your notice the possibilities in the use of gas for steam-raising. The working space in most printing shops is usually extremely limited. There is frequently congestion of plant, and little yard space available. Steam is required in practically all concerns. If coal or coke is used, a clean shop is converted into a dirty one. There is the difficulty of fuel storage and labour. Gas will cost more than coal for steam-raising, but with gas it is possible to use means of control, which practically eliminate the necessity for labour. Constant levels of water can be automatically maintained in the boiler, and gas consumptions can be automatically varied with the requirements of steam. This is done by allowing the pressure of steam to control the gas consumption. If steam of (say) 60 lbs. pressure is required, then the gas will be full on when the pressure is less than 60 lbs., and will be reduced as the pressure rises slightly above 60 lbs. Unfortunately, boilers which have been installed for coal or coke are rarely suitable for gas. The heating surfaces are insufficient, and the general design is such that the velocity of the gases passing through the boiler is so low that heat transmission is reduced to a minimum.

During recent months we have got out a range of designs for gas-fired boilers, horizontal and vertical, which will give efficiencies of at least 85 p.ct. Our Associated Companies have had a wide experience in the gaseous firing of boilers, and this experience is wholly available for British Furnaces, Ltd.

The Story of Coal.

Another of the series of advertisements telling "The Story of Coal," that is being issued by the Mining Association, appears elsewhere in our columns. It should receive the careful attention of all those enthusiasts for the report of Mr. Justice Sankey who think that it contained the final word of wisdom on the coal mining industry. The advertisement points out that in Great Britain the miner's working day is shorter than that of his foreign competitor. There would be no harm in this, perhaps, if the reduction in hours since before the war had not been accompanied by a very alarming reduction in the output per person employed. The public are inclined to ask why coal is not cheaper to-day. This advertisement of "The Miners' Working Day" supplies a direct answer. If the output per person in 1923 had been the same as it was in 1913, there would have been an additional 18 million tons on the market, and both the miners and the public would have benefited. This is one of those facts to which too much publicity cannot be given.

London and Southern District Junior Gas Association.—Arrangements have been made for a visit next Saturday afternoon, at 2.30, to the Old Kent Road Works of the South Metropolitan Gas Company. On Friday evening, March 21, at the Westminster Technical Institute, three short papers connected with the manufacture of gas will be read and discussed: "The Transmission of Heat in Boilers," by Mr. W. Newton Booth, B.Sc., Assoc.M.Inst.C.E., of Woolwich; "Automatic Coke Hoist," by Mr. D. Cleave Cross, Assoc.M.Inst.C.E, of Lea Bridge; and "The Centrifugal Separation of Gas-Works Emulsions." by Mr. T. H. Prater, of Tottenham.

Midland Association of Gas Engineers and Managers.—The annual general meeting of the Association will be held in the Grand Hotel, Birmingham, on Thursday, March 13, at 2.30 p.m. The opening proceedings will be presided over by Mr. P. N. Langford, of Coventry, the President. The 46th annual report of the Committee and statement of accounts will be presented, and, in accordance with notice given, Mr. H. Pooley will propose that the members' annual subscription be advanced in order to provide each member with a copy of the "Joint Transactions of District Associations." The new President, Mr. C. H. Carder, of Oldbury, will be inducted, and give his Presidential Address. A paper entitled "Some Problems and Their Solution" will be read by Mr. C. M. D. Belton, Assoc.M.Inst.C.E., Assoc.M.Inst.Mech.E., F.C.I.S., of Shrewsbury.

CURRENT PROBLEMS.

By E. W. Smith, D.Sc., F.I.C.

[A Paper read on Feb. 23 before the Wales and Monmouthshire Junior Gas Association.]

One of the most illuminating facts appearing in the Press during recent years was a statement made by Mr. D. Milne Watson before the annual meeting of the Gas Light and Coke Company—that the total energy in the form of gas supplied by this Company was now greater than the total energy supplied by the whole of the electrical undertakings in Great Britain. This is a fact that has probably not been previously appreciated by gas engineers any more than by the general public. Gas engineers and gas engineering do not stand sufficiently high in the estimation of the general public, and the importance of the gas industry is insufficiently appreciated. We who are in the gas industry are alive to the position which we hold in the nation's activities, but it is doubtful whether, either as a whole or as individuals, we realize the position we might hold if we would take a broad view of the possibilities latent in the industry, and the service we might still further render to the good of the State. It is my object to-night to put before you a conception, fallible though it may be, of some of the ways in which we might assume a broader outlook, and render still further service to mankind.

The gas industry is a public service, and it is inconceivable that one public service should, under a proper state of things, be placed in competition with another. All energy in bulk comes from coal. Energy is produced either by burning coal directly, or by converting it into other forms of energy, such as gas, coke, oil, and electricity. No one form can possibly claim a monopoly of advantage in all its applications. Nevertheless, owing to close competition, vested interests frequently bring about such circumstances that the consumer in many cases is deprived of the facility of choosing the particular form which will best suit his conditions from the point of view of convenience and cost. This form of monopoly and competition, while it has some advantages, has many disadvantages from the point of view of the State.

In any re-organization which may eventually be possible, the objectives must be:

(1) To give to the prospective consumer greater facilities in choice of form of energy.

(2) By improved organization and co-ordination to produce all suitable forms of energy with greater efficiency and at lower cost.

In parenthesis, I would like to say that cheap energy, whether in the form of coal, electricity, or gas, is one of the controlling factors in the cost of production in any process, directly or indirectly. There may be processes which require no fuel whatever, but the people engaged in these would be able to work for lower wages if the fuel they used domestically cost them less.

(3) The energy available should not be produced by methods which entail the pollution of the atmosphere.

One would like to see the complete elimination of coal as a fuel for industrial and domestic use. Great strides have been made already in this direction, in the use of gas, electricity, and oil. One need not enlarge on the advantages that would accrue if no coal were ever used in our homes. With the improvements of the gas-fire, and the extended use of modified forms of central heating, there will soon be every inducement for the householder to eliminate the use of raw coal.

The Question of Coke.

It will be some years before good coke can be dispensed with, either in industry or for domestic purposes. At the present time the gas industry does not find the selling of coke a problem of very serious magnitude. I am confident that this state of things will not last very long unless as much attention is paid to the quality of coke made as to the quality of gas supplied. Very few gas undertakings act as if they appreciated that coke was one of their chief assets. There is no need to enlarge on this subject. You are all fully acquainted with the difficulties, and, very likely, with the possibilities, of any change in the present state of things. There are some gas concerns who pay very great attention to their coke production. They sell comparatively dry coke, graded and sized for various purposes. These companies rarely have any difficulty in disposing at all times of the whole of their make.

Co-Ordination, Organization, and Distribution of Energy.

It would be very interesting, if only for the present from the academic point of view, if some experienced authority with a knowledge of colliery practice, the electricity industry, the gas industry, and the Nation's requirements for fuel, would make an extensive survey of the whole situation, and indicate how he would co-ordinate, organize, and distribute the latent energy available in this country, if he were given carte-blanche to do that which was best for the Nation as a whole. As a beginning it would be useful if the gas industry, which is by far the biggest of all the non-solid fuel purveying industries, were to assume that it should be the chief distributing agent for fuel in each locality where there was a works. Whatever conception they may have, however, they could not put it into force without legislative enactment.

The electric supply and gas undertakings should be in the ulti-

mate under one control, though each department would be under separate management, each requiring a specialized type of training and experience. In localities where there was no electric supply, the gas undertaking could very readily fill the need more efficiently, and at a lower cost, than if a separate electric undertaking were started. Coal and coke, for the time being, could be best distributed by such an organization. There would immediately follow a development in the production of a better solid fuel. Profiteering in local sales would be eliminated, and the study of the production of the best forms of fuel of all kinds would be given the best chance of development.

It will be a long time before solid fuel for domestic and industrial uses is completely eliminated. It is doubtful whether for many years it will be economic to do this. Development should be rather in the direction of producing smokeless solid fuel, low in ash, and free-burning. One can only admire the aspirations of those who are desirous of producing a low-temperature coke, in so far as their endeavours are idealistic, and not solely for financial gain. I am of the opinion that there is no likelihood of a cheap smokeless fuel being produced universally if the method depends on low-temperature carbonization. Here and there, in special cases, it might pay. Gas undertakings are best fitted to produce smokeless free-burning solid fuel Coke will always have to be sold; and, however cheaply the new solid fuel is made, when not produced on gas-works, it can be under-cut in price by both the collieries and the gas-works.

I believe that there will come a time when no untreated coal will be put into the gas-retort. It will be, when necessary, cleaned from ash, the latter being reduced to at least 5 p.ct. and blended, in order that when briquetted the resultant coke will be in the form of a briquette of such a structure that it will burn as readily as charcoal. Such a process is not so far distant as one might think, and its practicability is assured. The gas produced should be at least as cheap as at present. I am a firm believer that the free burning smokeless fuel of the future will be made at high temperatures rather than under the low-temperature conditions of well-known experimental processes.

Coal Cleaning.

There is no doubt that if coal conservation is to be tackled at all efficiently, coal cleaning will have to become general practice. No coal having an ash content higher than 5 p.ct. should be used in gas-works. The first question that will arise is: Should the coal be cleaned at the colliery or at the gas-works? Obviously, it is not practicable for any but the largest works to clean the coal they buy, and in all cases, unless freight is low, it would be much more economical to do the cleaning at the colliery. Coal cleaning by whatever process entails not only the disposal of the ash, but also a definite loss of carbon. This loss varies between 5 and 20 p.ct. The collieries can with advantage utilize for their own purposes fuel containing ash up to about 60 p.ct. The amount of this material produced in the coal-cleaning process should not be greater than the requirements of the colliery for fuel.

Generally speaking, at the present time, coal for gas-making purposes is sold at prices which are in proportion to its gas-making qualities. Insufficient attention is paid to the value of the coal for its coke-making qualities. The coke-oven industry naturally buys coal on the latter basis, rather than on the former. The gas industry should buy it on both bases. There has been demand from some quarters that coal should be purchased universally on the basis of its calorific value. This factor alone would not be indicative of the value of coal to the gas industry.

Coal cleaning is now a fully developed process. Many methods are being employed. They are all wet methods; and if a good separation of the ash is to be made, the coal has to be ground small. By coal cleaning, I am not referring to the rough methods frequently used at collieries, which produce what is known as "washed coal." In most cases, these do not make sufficiently good separation of the ash. As all commercial methods of coal cleaning require the use of water, most washed coals are high in moisture, particularly if they are small. Various methods have been tried for drying such coals. Most of them are either too expensive in fuel or too high in capital expenditure.

Last October I saw a new type of coal drier at Pueblo, in Colorado, which had been developed and patented by Mr. H. B. Carpenter, the Superintendent of the Bye-Product Coking Plant of the Colorado Fuel and Iron Company. The drier I saw had an output of 100-tons of coal per hour, and extracted 80 p.ct. of the moisture, reducing it in most cases to between $3\frac{1}{2}$ and $4\frac{1}{2}$ p.ct. Supervision was negligible, maintenance low, and power consumption between $\frac{3}{4}$ and $1\frac{1}{2}$ H.P. per ton of coal dried, the actual amount depending on the fineness of the coal. This system has not yet been applied in this country, but arrangements have been made for its introduction here, and it should have an extensive sale.

Coal Testing.

Practically all gas undertakings should be in a position to test the coals they buy and receive. The proximate analysis is a guide, but is inadequate; and so it is with the coking test. Few gas undertakings can afford to have a full-scale test plant; and such plants are so large that rapid tests cannot be carried out therein. The small $2\frac{1}{2}$ lb. retort test has been used for many years; but the method of testing has not been worked out in such a manner that the records obtained from two samples of the same coal agree sufficiently closely. There is a definite demand for a small-scale testing plant, and a method of running it which will give comparative results indicative of the value of the coal from a gas-making point of view. If the Research Committee of the Gas Investigation Committee could find time to carry out this investigation, a most valuable adjunct to gas-works control would be supplied, and the methods would carry with them the authority of this Joint Committee. No method, however good, would be satisfactory unless it included a complete description of how the coals should be sampled. I have recently had particulars given to me of a method which has been devised by the chief chemist of one of our large gas undertakings, which, to my mind, fulfils all the requirements in this connection. It is to be hoped that he will be able to give an account of these methods for the general good. Dr. Weyman's retort, mentioned in his paper in 1922, would appear to be suitable in every way for the coal tests I have in mind.

Calorific Values.

I imagine that Mr. M'Donald, in his remarks before Scottish engineers last week, was "pulling the legs" of his fellow engineers when making comparisons of declared calorific values and prices. He asked, in effect, why there could not be one standard calorific value for all. Nowadays, gas-burning appliances are equally efficient, if properly adjusted, for a very wide range of calorific values, though the range is probably not so wide as has been indicated by Mr. M'Donald. Those of us who had not the opportunity of hearing what should have been a most illuminating discussion following Mr. M'Donald's paper, will be excused if we comment on the statements made. Each gas engineer attempts to obtain at the lowest cost possible the maximum number of therms per ton of coal. Coals vary very considerably; and the type of plant in use and its condition vary equally as much. It is consequently unreasonable to expect that even an approximately constant calorific value could be set for all gas companies. If it were possible, there would have been no attempt to introduce the therm basis of charge.

Purification.

No one in the gas industry can be entirely satisfied with the methods employed for extracting sulphuretted hydrogen from coal gas. The ground space required is excessively large; the process is intermittent; a large bulk of solid material has to be handled; and, with the difference in qualities of oxide, and the variations that may occur in the temperature, humidity, and alkalinity of the gas, it is unreliable except in those cases where an excessive amount of purifying area is provided. Nevertheless, the cost of purification, because of the credits for spent oxide, is comparatively low. A great deal of work has been carried out in past years in an attempt to extract sulphuretted hydrogen in a continuous process, displacing the use of solids by means of liquids—displacing the shovel for the pump. None of these so far has filled the bill completely, though there are many undertakings in the States employing the sodium carbonate method. This process entails the disposal of a large amount of air containing sulphuretted hydrogen. In most cases in the States this air is further diluted, and put into the atmosphere. In some cases the air is used in producer and water-gas plants; the sulphuretted hydrogen being converted to SO_2.

We cannot, on this side, give serious consideration to any process which necessitates the fouling of the atmosphere by H_2S or SO_2. I am of the opinion, however, that the process may be modified and the sulphur recovered. If this can be done, then a cheap process will be available which will not only have the effect of taking from the gas the H_2S, but will eliminate cyanogen with its consequent evils, and completely obviate the necessity for the addition of air for revivification purposes. This will mean that the gas will be increased in calorific value by the extent to which the air has been eliminated, and reduced in specific gravity; the capacity of all plant, holders, and mains will be increased, and the amount of power necessary for distribution purposes will be reduced. I hope to let you know more about this matter at a later date, if the researches that are being carried out reach successful fruition.

Benzole Production.

During the war a large number of gas undertakings put in washing plants for the production of benzole. Prior to that time the only benzole produced in England came from tar-works and coke-ovens. At the present time very little is being extracted from coal gas. This is a national hardship. Motor spirit is being used in increasing quantities. There is practically a monopoly in supply. If new companies are started for the distribution of petrol, they are quickly wiped out by the larger ones. The effect of the competition of the smaller companies must therefore have been felt by the larger ones. Petrol is rapidly becoming a necessity, even if it has not already become so. The large bulk of petrol comes from foreign sources. If the gas made from the whole bulk of coal carbonized either in coke-ovens or by gas undertakings were to be stripped of its benzole, there would not be sufficient to supply the Nation's needs for motor spirit. Nevertheless, the effect of the competition between benzole and petrol would be to keep the price of the latter within reasonable limits. The sole question that arises, therefore, is: Does it pay to extract benzole from gas on gas-works? I am of the opinion that in most cases it does pay, particularly since the introduction of the therm basis of charge. It certainly did not pay under the candle-power basis, and under conditions when calorific values had to be maintained at a higher level than they are to-day.

Gas is being produced on the works to-day at a cost of between 1½d. and 3½d. a therm. Benzole is being retailed at 2s. 3d. per gallon, which corresponds to 1s. 6d. per therm. There is no doubt that an efficiently-run benzole extraction plant could produce benzole at a cost of no more than 6d. per therm. If to this be added the value of benzole in the form of therms in the gas—namely, 3d.—the expenditure entailed by the gas undertakings would be about 9d. a therm, leaving a margin of 9d. to cover distribution and profit. The cost of distributing benzole, including everything, may be taken at about 4d. per therm, so that there should be a definite profit in its production at gas-works.

I was glad to learn the other day that the National Benzole Association has arranged for a Distributing Centre for "National Benzole" and "National Benzole Mixture," at Pontypridd, in South Wales. This depôt will have a 60,000 gallons capacity. The organization will be under the direct supervision of the Great Western Colliery Company; and the benzole will be made largely from the tar and gas produced by the Maritime Coke-Works. Gas-works in South Wales will consequently have a ready outlet for their crude benzole and tar; and South Wales will be well served with home-produced motor spirit. This is an enterprise which redounds to the credit of the National Benzole Association and the colliery concerned.

Another interesting feature in this connection is that the whole of the gas for the town of Pontypridd is now supplied from the Maritime Coke-Works; the gas being pumped through a 4-in. main a distance of 1¾ miles, where it is purified on the gas-works before distribution. The gas has a calorific value of 480 B.Th.U. It is also interesting to note that the majority of the Pontypridd Urban District roads and tramways are laid with the special road tar manufactured on the same works as the "National Benzole." As it is an established fact that benzole and benzole mixtures give better results than petrol, both as regards power and mileage per gallon, South Wales is indeed fortunate in having such facilities.

Utilization of Waste Heat.

The valuable work carried out by the Gas Investigation Committee in connection with the utilization of waste heat, and the paper read by Mr. Thorman, of the Gas Light and Coke Company, have drawn special attention to the possibilities in this direction. My own Company have for some years paid special attention to this matter, and at the present time there are 42 waste-heat boilers attached to Woodall-Duckham verticals. The aggregate steaming capacity of these boilers is 180,000 lbs. per hour, which is equivalent to a saving of over 100,000 tons of coke per annum, or 6000 H.P. per hour, or 4000 KW.-hours. Much more needs to be done in this direction; but there are undertakings in which the whole of the power required, together with the necessary steam for steaming in verticals, is being produced by means of waste heat. Under these conditions benzole production, in which the cost of steam is the chief item, might very easily be carried out at a still greater profit.

Bye-Products.

The bye-product side of the gas industry is receiving more and more attention. Cyanogen is being extracted in a few works, but it is doubtful whether this would be profitable if it became the rule, for methods of cyanide production, independent of the gas industry, have been developed.

Now that ammonium sulphate distribution is so highly organized, much more has been possible in connection with the production of a better sulphate. Fortunately, the British Sulphate of Ammonia Federation are setting a high standard. The number of methods and processes for the production of dry neutral salt is legion, and a book could be written on this subject alone. It is a pity that this information is not fully available to all those who are desirous of producing dry neutral sulphate, as much time is wasted in the development of new processes, when perfectly satisfactory ones are already available. No one method would suit all places and conditions, but there are two or three which stand out pre-eminently as being entirely satisfactory, with low cost of operation.

There has been a tendency in recent years for gas undertakings to join in profit-sharing schemes with the tar distillers. This has been of great advantage. For the national good, and particularly for the good of individual gas undertakings, it is highly desirable that flexibility in such arrangements should be maintained, leaving it to all gas concerns to dehydrate their tar for road purposes, if they so desire. The return from such dehydration is usually higher than the return from complete distillation, if it is only because a great part of the transit charges to the tar distillery is eliminated. The revolution which has been made in recent years in connection with tar distillation, and particularly in tar dehydration, is such that gas undertakings, large and small, need have no qualms as to dehydrating their own tar from the point of view of either cost or complexity. Baby stills are now in successful operation, as well as still units having an output of 50 tons per day, for either distillation or dehydration.

Wembley Exhibition.

In connection with the British Empire Exhibition at Wembley, there is to be a World Power Conference held in June. It is unfortunate that the Conference clashes with Institution week, as few gas engineers can be away so long from their works. It is to be hoped that all who can attend this Conference, and the Exhibition as a whole, will do so. The Exhibition itself will be worthy of the fullest support from members of the gas industry. It should prove one of the greatest stimulators of trade; and the gas industry, together with the whole community, depends largely on an improvement of trade. British Empire clubs should be formed for the purpose, where necessary, and facilities should be given by undertakings for their staffs to visit the Exhibition.

Increased Gas Sales.

Increased gas sales will be brought about with the improvement in trade, and the reduction in the price of gas. There are many factors which control the price of gas, but in most undertakings it will be found that the larger the output and the more constant the load, the cheaper will it be possible to sell gas. There are two points that I wish to raise for your serious consideration in this connection. With the improvement in design and fixing of gas-fires, the æsthetic objections to the gas-fire have been largely removed. Nevertheless, gas-fires are still in many instances a luxury as regards cost of fuel. Gas is sold by most undertakings on a sliding scale, the price going down with increases in gas consumption. In very few houses is it possible to burn enough gas to reduce the charges below the top domestic rate. Now the gas-fire load is an extremely valuable one, and if the consumer can be induced to eliminate the use of solid fuel, then gas-fires will not have to be used intermittently, but continuously. The only inducement at the present time is cheap gas. It is entirely reasonable that the top rate should be paid for gas when one gas-fire only is being used intermittently in any given house; but I submit that it would handsomely pay some gas undertakings to put forward a sliding-scale for the reduction in price of gas, which sliding-scale would have steps in it which would correspond to gas consumptions of about 10,000 c.ft. per quarter. The difference in charge for each step should be definitely worth while to the consumer. Some such policy has already been adopted by certain undertakings. The same applies to the use of gas-heated water circulators, and other gas-consuming domestic appliances.

Another, and perhaps more important direction in which concentration of the gas industry would be well repaid is that of a systematic, elaborate, and scientific handling of the application of gas to industry. A large number of undertakings appreciate the importance of this side. To my mind, it is the most important section of the gas sales side in industrial areas. This is recognized by some gas undertakings, who have industrial furnace departments. Much more, however, could be done. Many undertakings cannot afford to run such departments, and to staff them adequately. It does not directly pay the furnace companies to extend in this direction. Domestic gas-appliances can be made on mass production lines, and relatively little technical service has to be rendered by the maker in the installation of these appliances. Gas furnaces and industrial appliances are in a very different category. Each installation has to fit the particular job, and a technician is necessary if high efficiencies are to be obtained. Low-efficiency appliances will no longer be installed by the majority of industrialists, and consequently a technical man is essential. Who should supply this technical knowledge? Only the large gas undertakings can afford such a man. The gas-furnace makers would make their appliances prohibitive in price, if the price had to cover the cost of all the technical advice that is necessary with a large number of installations. That is surely a matter for co-operative action. It is to the interest of everybody in the gas industry—makers of appliances and makers of gas—to encourage the use of gas for industrial purposes.

I am sure that there is room for an Association of Industrial Gas Appliance Engineers. At any rate, as a beginning, I am sure it would be worth while forming a section in the Institution of Gas Engineers. It would be of no use including the whole of the members of the Institution in such an organization, as only those who have something to contribute to the subjects relating to the combustion of gas and furnace design would be of much help. The organization ought to be open both to industrial sales engineers of gas undertakings and to the engineers attached to the furnace and industrial appliance makers. As there are not very many of the latter, there would be no fear of the gas undertaking side being swamped. Perhaps an organization separate and distinct from the Institution of Gas Engineers could best be formed.

I am afraid my remarks this evening have covered very inadequately a large number of topics. They are intended to stimulate discussion, and to create a broadened outlook, and an increased interest in all that appertains to our great industry. The subject of education and training is one that should not be overlooked. I do not intend, however, to deal with it at all to-night. I have no doubt whatever that immediately gas undertakings are prepared to pay salaries which will attract men of technical training and experience, the problem as to improved technical education will soon be settled. At the present time there is very little inducement to those in the industry to improve their knowledge, and it is not at all to be wondered at that there is a deficiency in the technical training of many of the men holding positions in our gas undertakings.

Scottish Junior Gas Association (Western District).—There will be a meeting next Saturday evening (March 8), at 7 o'clock, in the Royal Technical College, Glasgow, when Mr. Robert Gray, of Hamilton, will read a paper entitled "Modern Methods of Carbonization." A visit to the works of Messrs. R. & A. Main at Falkirk has been arranged for Saturday, March 22.

INAUGURATION OF 100-TON TENSILE TESTING MACHINE AT BIRMINGHAM.

There was a large and representative attendance of public men, manufacturers, and heads of technical departments of the University and Technical School at the inauguration by the Lord Mayor of Birmingham (Alderman Williams), on Feb. 25, of the new 100-ton tensile testing machine at the Research Laboratories of the Birmingham Gas Department. All the members of the Gas Committee were present, and the chief officials of the Department.

The company assembled in the offices of the Gas Department; and before proceeding to the Laboratories, the Lord Mayor referred to their excellent equipment, and to the latest addition—the huge tensile testing machine. The hope of the Department was that manufacturers would take full advantage of the facilities provided. Additions to the plant would be made if occasion arose. The importance of gas for manufacturing purposes had been emphasized at the National Gas Conference in Birmingham. The work of the Laboratories had brought many orders for the Gas Department; and this, of course, meant increased consumption of gas.

Alderman J. H. LLOYD (Chairman of the Birmingham Gas Department) said that at first sight it might seem curious that physical testing machines of the character of the one to be inaugurated that afternoon should be installed in the Gas Department, though of course it would be recognized that there was considerable work of the kind to be done for the various departments of the Corporation. Apart from this, however, in connection with their work on gas-furnaces they had discovered that to do this properly, and to give the required assistance to manufacturers, it had been necessary to extend the Laboratories to deal with such questions as the constitution of metals, alloys, &c., and their physical testing and chemical analysis. Only in this way was it possible to assist manufacturers in overcoming difficulties in works practice. The result had been the setting up of what might be correctly described as a "Local National Physical Laboratory." They were indeed fortunate in having at the head of their Industrial Research Staff Mr. C. M. Walter, D.Sc., A.M.I.E.E., M.Inst.Met., who had been trained at the Birmingham University. Manufacturers who had been brought into touch with Dr. Walter through the activities of their industrial heating section, had come to him on the outbreak of war and had asked for assistance in their problems. In almost every case, the problem had some connection with the use of gas; and the Committee decided to extend the Laboratories, and to instal a 25-ton tensile testing machine, which was supplied by Messrs. W. & T. Avery, Ltd. It was no exaggeration to say that the installation of that machine had helped considerably in speeding-up the output of munitions from their area. With the cessation of hostilities, and the slump in trade which followed, the Laboratories, in common with all such institutions, were less busy; but he was glad to say that, during the last six months, there had been a continued increase in the work. The 100-ton tensile testing machine was also supplied by Messrs. W. & T. Avery, Ltd.; and it was gratifying to know that a local firm was at the forefront in connection with the manufacture of machines of this kind. The Gas Committee had been at first a little diffident of installing this larger machine, for the opportunity of obtaining it had occurred during the slack period to which he had referred; but it was already evident that the decision was a wise one. Investigations on the industrial uses of gas had been of inestimable value to the special staff of the department in designing new types of furnaces, which had resulted in considerable saving in cost to manufacturers. At Windsor Street was a large tube furnace designed by Dr. Walter, and which was producing results previously impossible. Recently Dr. Walter, in collaboration with Messrs. Gibbons Brothers, of Dudley, had designed a new type of furnace which was enabling work to be performed which hitherto had been thought impracticable. Large furnaces and muffles could be fired by town gas at ordinary pressure, working at temperatures as high as 1500° C. This result had been brought about by the scientific design of a regenerator of the counter-current type, somewhat similar to that used in the larger forms of steel-smelting plant. When this was employed in conjunction with a system of pre-heating of the gas prior to combustion, it was possible to obtain very high temperatures with a moderate consumption of gas. Mainly owing to the progressive policy which had been followed, the quantity of gas used for industrial heating during the last ten years had increased by approximately 1300 million c.ft. per annum. As a result of their early investigations, furnace plant designed by the department had resulted in many types of apparatus becoming standard, not only in this country, but in other parts of the world; and the department were frequently called upon to give assistance to the undertakings in this and other countries.

The Company then proceeded to the Laboratories, where the apparatus was described by Dr. Walter; and Mr. V. E Green, his chief assistant, had charge of the two large tensile testing machines. The Lord Mayor formally put the 100-ton machine into operation, and its testing capacity was demonstrated by pulling a 2-in. diameter steel bar.

Lt.-Col. OUTRAM (Deputy Director of the Aeronautical Inspection Department), in moving a vote of thanks to the Lord Mayor, mentioned how much the establishment of these Research Laboratories had been appreciated by the Air Ministry. A large amount of testing work had been carried out for that Department during the war, and also since the cessation of hostilities, on all classes of aircraft material. At the present time, every piece of tube, bar, and sheet had to be thoroughly tested; and unless there were considerable facilities for carrying out such tests, it meant that they did not get the amount of testing which was necessary and desirable, or that there was considerable delay. They particularly welcomed facilities for tests by the Gas Department, who acted in the capacity of an independent public test-house, the results of which could be relied upon by everybody. With the increased size of engines and aircraft, testing-machines of larger capacity would be invaluable.

The vote of thanks was seconded by Mr. GILBERT VYLE (President of the Birmingham Chamber of Commerce and Managing Director of Messrs. Avery, Ltd.) who, on behalf of the manufacturing community, thanked the Gas Department for the facilities they had provided.

The interesting proceedings then terminated; and the company took tea at the invitation of the Gas Department.

DETAIL OF THE TESTING MACHINE.

The machine was manufactured by Messrs. W. & T. Avery, Ltd., and is of the vertical single-lever type, operated by four straining screws which are driven through suitable reduction gearing by a 15-H.P. 440-volt motor. The travelling poise weight is split into three portions—namely, two half-ton weights, and one one-ton weight—which allows the machine to be used with a full scale capacity of 25, 50, or 100 tons. This poise weight can be moved along the beam by means of a hand operating gear, or by an electrically-driven motor and clutch; the motor-driven gear being especially useful for compression tests on hard materials, and also for returning the poise to the starting end of the beam after completing a test.

In addition to tension tests, the machine can be used for compression or transverse tests; and, owing to the arrangement of the stirrup supporting the bottom compression plate, the stress on the screws and the main members of the machine is always in one direction. The maximum size of tension test-pieces is 3 in. diameter at the gripped end; and compression tests can be carried out on samples up to about 11 in. dia. by 4 ft. long. The transverse bending beam takes specimens up to 5 ft. span. The control of the main electric driving motor is of the push-button contactor-operated type, so arranged as to give a wide variation of straining speeds; while the whole of the control gear is situated near the poise-moving handle, so that the article being tested is easily visible to the operator.

The machine has been installed to extend the testing plant already in existence in the Strength of Materials Laboratory at the Council House. The demand for tensile and compression tests has increased enormously of late years, and the Department found that the 25-ton machine, which was put into operation in 1917, could not adequately deal with the new classes of tests which were constantly being required by the various manufacturing concerns using the Laboratories.

A complete set of tools is available for bending, and a massive bending beam is slung from the top knife-edge for this purpose, being so arranged as to accommodate a load of 100 tons applied at the centre of the specimen, which is mounted on cylindrical-seated supports up to 5 ft. centres.

It will be understood from the above that tests on large cubes of concrete can be carried out without difficulty; compressing faces with spherical seats being used for this purpose. In the case of moulded concrete blocks, the specimens to be tested usually take the form of 6-in. cubes. In addition to concrete testing, compression tests have been performed on numerous metals and alloys; the specimens being generally in the form of cylinders or tubes with accurately machined or ground flat ends. A great deal of useful information has already been obtained with regard to the crushing strength of wood blocks, wooden struts, building material, blast-furnace slag, granite and granite setts, stone from local quarries, and other material used as aggregate in the manufacture of road metal. In this connection, a considerable amount of work is done from time to time for the Public Works Department of the Corporation. Tests have also been carried out on the bursting and transverse strength of pipes, conduits, and other constructional material. Investigations have been made on the compressive strength of rubber buffers, and also on the rating of helical and laminated springs for railway rolling-stock. Much work of this kind has been carried out in connection with the construction and repair of railway wagons owned by the Electric Supply and Gas Departments. Further, the Laboratories have been able to assist the Tramways Department to some considerable extent with regard to their permanent way, tramway cars, and motor-bus vehicles. An additional application of the use of the compression tackle is the testing of large beams such as tramway rails, steel joists, and structural members, for transverse strength.

Some very interesting tensile tests of a special nature have already been carried out on the machine. The accommodation between the jaws is such that specimens can, if necessary, be tested at temperatures other than atmospheric, by the introduc-

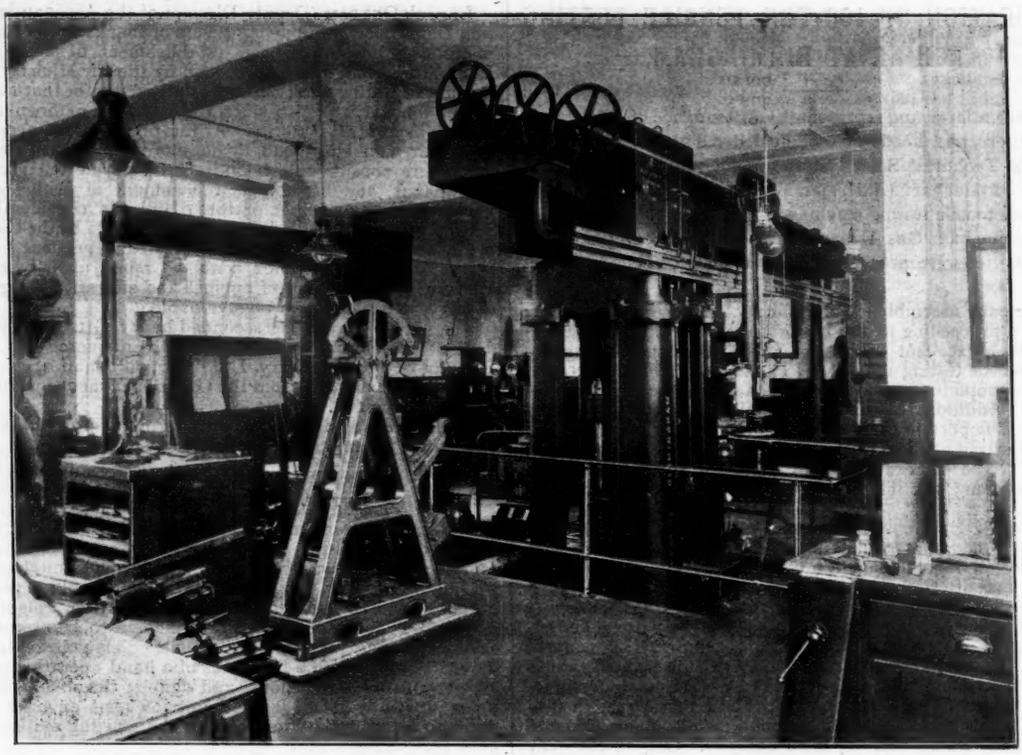


FIG. 1.—THE 100-TON TENSILE TESTING MACHINE.

tion of heating furnaces surrounding the specimen itself. In addition to many other applications, the machine can be used for the testing of such apparatus as jacks, cables, chains, pulley-blocks, and other similar gear. It is interesting to relate that this 100-ton machine is one of the largest of its kind in the country, and is capable of accurately registering a load between the limits of 20 and 224,000 lbs.; the knife-edge construction being so correctly arranged that the weight of a comparatively small test specimen will cause the beam to move. Fig. 1 is an illustration of the new installation.

The Growth of Gas as an Industrial Fuel.

In September, 1909, the Gas Committee gave instructions for certain experiments to be carried out, with a view to ascertaining the possibility of the use of town gas as an industrial fuel. The results of these investigations proved that gas-furnaces could be employed in a much larger way than had hitherto been done, and, further, that increased efficiency could be obtained by the adoption of scientific design. In consequence of this, a special section was established, including showrooms, demonstration foundry, and heat-treatment shops, where furnaces of large capacity were demonstrated to interested manufacturers. This innovation met with immediate success, and resulted in an increased quantity of gas being used for industrial heating purposes. Several large furnaces were working in the city in the year 1911, and it was found essential to establish metallurgical laboratories to enable the Department to deal with the many difficulties which had to be overcome to meet the requirements of manufacturers. With these laboratories working in connection with the heat-treatment shops and foundry, a large amount of pioneer work was done in the development of industrial heating plant suitable for dealing with the numerous processes carried on throughout the Department's area of supply.

Prior to the year 1909, no dissection of the gas used for industrial heating purposes (apart from motive power) was made; thus, until the half-year ended March, 1910, no figures were available as to what percentage this represented of the total gas consumed. In the year ended March, 1911, the gas used for industrial heating represented 5·06 p.ct. of the total quantity sold by the Department. The consumption for this purpose gradually increased, and in the twelve months ended March, 1913, the quantity was 6·95 p.ct. During the year of maximum gas consumption (1917-18) the figure was 22·33 p.ct., and for the twelve months ended March, 1923, the sale for industrial heating equalled 15·22 p.ct. of the total gas consumed in the Department's area. For the six months ended September, 1923, the figure was 19·28 p.ct.

With the increasing demand for gas for industrial uses, it was necessary, in designing furnace plant to suit the varied manufacturing processes involved, to carry out investigations of a metallurgical and engineering nature, with the result that many manufacturing firms were constantly in touch with the Industrial Heating Section. It became apparent to these concerns that the Gas Department was able to render them valuable assistance in solving many of their industrial problems, and in this way the Department became intimately acquainted with many of the staple industries of the city. Owing to continued requests by manufacturers for increased assistance of a technical nature, which could only be given by the extension of the Laboratories, the Gas Committee obtained the Council's sanction to this being done, and the Laboratories were ultimately enlarged to their present size. This action has been more than justified. Since the extension, a great deal of research work has been carried out, and the Laboratories are becoming more and more valuable as a means of assisting the manufacturers in the Department's area of supply in overcoming the various problems of manufacture which present themselves.

In no other town or city in the United Kingdom are the uses for which gas is supplied so varied as in Birmingham. At the present time, town gas is utilized in practically every trade in the district, covering many thousands of processes. Most of the large firms have adopted gas for the heat-treatment of metals, including carburizing, hardening, and tempering, and also for annealing in the case of ferrous and non-ferrous alloys. Gas is also universally employed as a heating agent by firms connected with the motor and cycle industries. In the brassfoundries of the city, gas is applied for the melting of metal alloys; and upwards of 90 p.ct. of the aluminium castings in the district are produced by gas-heated furnaces. An important advancement in the use of gas is its application to the firing of ceramic ware, such as sparking-plug insulators, and the various types of insulators used in the electrical trades. Another field in which it is largely used at the present time is the enamelling and firing of low and high temperature enamels such as meter dials, clock faces, advertisement signs, and similar articles.

Work Performed by the Various Laboratories.

In the Laboratories, research work is conducted in connection with the manufacture and working-up of brasses, bronzes, aluminium alloys, steels, and other metals used in the various industries of the city. A small laboratory is also equipped with the latest types of apparatus for the microscopic examination of metals, and for the photographing of them. This latter apparatus consists essentially of high-powered microscopes used in connection with a special form of camera and optical bench.

The strength of materials and physical testing laboratory is fitted-up with all the necessary machines for testing the physical properties of metals and alloys; and its equipment includes the 100-ton tensile testing machine described, together with a 25-ton combined tensile, bending, torsion, and shearing testing machine. Other physical testing apparatus in this laboratory include the Brinell and scleroscope hardness testing machines, and Izod impact testing machine, together with a complete equipment for carrying out tests on cement and concrete.

The electrical laboratory is fitted up with a complete set of standardized electrical instruments, including reflecting galvanometers, potentiometers, standard bridges and resistances for use in connection with the calibration of temperature-measuring apparatus and the standardizing and testing of electrical instruments, including pressure and current measuring meters, watt, watt-hour, and ampere-hour meters. Certain of the apparatus is

used for obtaining the melting points of metals and alloys, and also for determining the critical points of steels. A further testing set includes a special apparatus devised for the testing of magnets.

A separate metallographical laboratory has recently been equipped with modern apparatus required in connection with the microscopic examination of metals, non-metals, alloys, and other material. In addition to special microscopes, there is apparatus installed which enables the structure of any material to be quickly projected on to a screen, and visually examined or photographed. This has proved of invaluable aid in connection with heat-treatment problems which have had to be dealt with from time to time. Associated with this laboratory is a photographic section; photographic methods being employed for illustrating reports on furnaces, and other tests required by manufacturers.

At the Windsor Street Works of the Department are situated the experimental foundry and hardening shops, which are used for the preparation, heat-treatment, and melting of metals and alloys. These have been equipped with plant to enable manufacturers to carry out on a full scale any test they may require in connection with annealing, carburizing, re-heating and quenching, normalizing, hardening, and tempering of fine tools, gauges, cutters, beds, dies; the heat-treatment of high-speed and alloy steels, annealing of cast-iron, and the manufacture of malleable castings, the melting of brass, bronze, gun-metal, white metals, aluminium, and aluminium alloys. A special plant has been installed for the hardening and tempering of very large steel dies, beds, tools, cutters, and machine parts. Already a large amount of investigation has been carried out for manufacturers in these shops; and in some instances several tons of work have been dealt with in order to obtain results comparable with those which would be obtained when working on a full practical scale on their own premises.

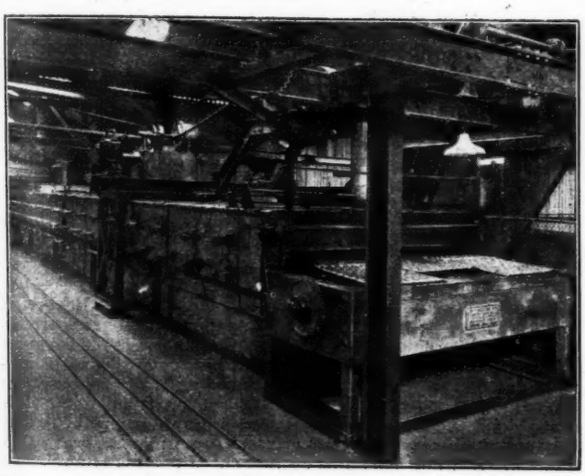


Fig. 2.—Gas-Heated Biscuit Oven.

Experimental Laboratories and Industrial Showrooms.

Recently, extensive showrooms for industrial appliances have been opened in a new building acquired by the Department at No. 15, Edmund Street; and already a large number of manufacturers have taken advantage of the facilities afforded for the inspection and demonstration under practical working conditions of the furnaces and apparatus designed for their particular requirements. Fig. 2 is a photograph of a large gas-heated biscuit oven.

The success of the Laboratories is beyond question; and the research work which has been conducted has been the means of assisting manufacturers considerably in increasing efficiency and effecting economy in their working.

Southern Association of Gas Engineers and Managers.—As already intimated, the annual general meeting of the Association will take place on Wednesday, March 19, at the Connaught Rooms, Great Queen Street, W.C., at 2.15 p.m., after luncheon which will be served at 12.30. The President (Mr. Leonard J. Langford) will deliver his address, and a paper will be presented on "Coke-Handling Plant at the Portsmouth Gas-Works," by Mr. S. E. Whitehead, B.Sc., of Portsmouth. The election to honorary membership of Mr. A. F. Browne will be proposed.

New **Governor House at Sutton.**—A substantial brick-built governor-house on an entirely new site has been erected at the works of the Sutton (Surrey) Gas Company. The house is 50 ft. long by 25 ft. wide, and contains one 24-in. and two 18-in. double-cone equilibrium station governors. In the arrangement an 18-in. safety governor is placed in order to maintain a supply to the station-governors should the gasholder outlet be closed in error. Instead of the usual cones, the safety governor is fitted with flat discs, and a quicker action is obtainable than with the ordinary type. The governors are all of Messrs. W. Parkinson & Co.'s make, and have proved very satisfactory in operation.

MIDLAND JUNIOR GAS ASSOCIATION.

A meeting of the Association was held at the Council House, Birmingham, on Feb. 21—Mr. H. Clarke (Vice-President) presiding. Mr. F. Sylvester, of the West Bromwich Gas-Works read a short paper on

VERTICAL RETORTS.

The following notes are given in an endeavour to describe briefly the conversion of an early installation of vertical retorts, which had developed serious defects due to various causes, into an installation of comparatively modern type.

The plant at West Bromwich to which these notes refer was erected in 1913, and comprised five beds of four 5-ton retorts with a nominal capacity of 1¼ million c.ft. of straight coal gas per day. The plant was of the Woodall-Duckham type. Doubtless, most of the members are familiar with the general design and features of this plant; and the points which I propose to submit will probably be of interest more particularly to those members who have not had an opportunity of closely observing the working and behaviour of vertical retorts.

The original vertical-retort installation was constructed with regenerators to each setting; the primary-air, secondary-air, and waste-gas flues running partially under the producer ash pan, the producer being placed between the retorts and in the settings. The primary-air flues were conducted round the bottom of the retorts, and finally entered the producer at the back. By this means the primary air was heated on its way to the producer. The secondary-air and waste-gas flues were built in between the two primary-air flues; and in this manner the whole of the flues were brought into close proximity. The ash pan was designed to contain water, the level of which was determined by an overflow. In actual practice, it was found that, unless extreme care was exercised to keep the overflow clear, there was a danger of water rising in the pan and flowing either down the primary-air flues or over the sides of the pan into the brickwork.

After the plant had been at work for some time, difficulties arose in obtaining efficient carbonizing temperatures; and this necessitated an examination of the flues in connection with the regenerative system. It was found that at some time or other water had been getting into the flues, and had resulted in the disintegration of the brickwork of the flues under the ash pan, causing short-circuiting. This entirely interfered with the regular working of the heating arrangements of the retorts; and, while the producer could get sufficient air to make all the producer gas that was required, the passage of the secondary air to the setting was interfered with, allowing unconsumed producer gas to pass forward *viâ* the waste-gas flues to the main flue. The unconsumed CO, meeting the primary air under the ash pan, caused local combustion; and the flues were practically destroyed. In order to remedy this, it was decided to cut out that section of the regenerator immediately below the ash pan; and, despite the reduced capacity for regeneration, a considerable improvement in the carbonizing temperatures was effected. Various other experiments were tried with a view to further improving the results, but it was eventually decided to reconstruct and modernize the whole plant. The Woodall Duckham Vertical Retort Company, Ltd., were entrusted with this work, and commenced in the spring of 1922. Meanwhile, the gas supply to the town had to be maintained by the use of horizontal retorts and water-gas plant.

At the outset, the whole of the brickwork of the five settings was entirely dismantled, leaving only the end walls and ironwork undisturbed. Reconstruction commenced off the bottom castings; the retorts being rebuilt on the original lines, with the exception that a belt of silica, 12 ft. deep, was introduced at the carbonizing zone, and the combustion flues were slightly decreased in area. The retorts were also provided with fireclay tubes having steam nozzles built into the bottom of the retort for the purpose of steaming. Particular attention was given to the building of the regenerators and retorts; a new feature being the introduction of two pockets in the CO flues on either side of each bed, for the deposition and easy removal of dust coming forward in the producer gas. We had experienced a great deal of trouble with accumulation and removal of dust in the old plant.

The producers are of the step grate type fitted with doors having primary-air slides. The latter were, however, dispensed with when starting up the plant. An alternative primary-air supply is provided by two cast-iron tubes, 3 in. dia., passing through the brickwork under the producer doors. The outside ends of the tubes are fitted with an adjustable circular slide device through the centre of which is passed a steam nozzle, the steam supply to the nozzle being regulated by a steam valve. The inner end of these tubes is turned upwards to the base of the fire and covered by a cowl to distribute the incoming air over the whole area of the grate. The injector effect of this arrangement allows of a very fine adjustment of the amount of primary air admitted to the producer. The producers were built at the old level, to avoid disturbing the existing clinkering staging; and, compared with the modern practice of placing the producer at check-damper level, we have not found any disadvantage, an excess of producer gas always being available. Recent analyses gave 24 to 25 p.ct. of CO, with 5 to 6 p.ct. of CO_2. Analyses of the waste gas showed 18 to 19 p.ct. of CO_2 at the entrance to the main flue.

The actual time taken for drying the settings before commen-

cing gas making was nine weeks, which allowed full opportunity for the brickwork to become well seasoned; and during this time records of the expansion of the settings indicated that the movement had been uniform throughout. Distortion in and around the silica belt of the retorts, owing to the difference in the coefficients of expansion of the silica and firebrick work, was prevented by the insertion of wood and paper sheets in the brickwork, and the customary lead washers at the ends of the tie rods. The drying process was carried out in a very cautious manner, and was started as early as possible with a small fire on the bottom two plates of the producer. As the fire was increased, close attention was given to the tie rods, and daily observations of the expansion were made. When the fire had reached a level nearing the back arch of the producer, care was exercised to keep the heats at this point under control; and the producer was closed up immediately the temperature in the combustion chambers was high enough to ensure the ignition of the CO from the producer.

During the raising of the heats to working temperature a slight pressure was maintained at the top sight holes; thus ensuring a long flame condition in the combustion chambers, with a little unburnt CO at the check dampers, and avoiding cutting flames and sharp top heats. This top pressure has been continually maintained. Examination is made about every two hours, and any variation regulated by the primary air to the producers; the steam-injector arrangement previously referred to proving most efficient for this purpose. All damper positions are recorded as changes become necessary; and in this connection we have found it useful to record this information on the buckstays, which we had specially stencilled for the purpose, appropriate to each retort. In this way the exact working position of each damper can be noted at a glance. After the retorts had reached working temperature, a careful examination was made of all brickwork, and particular attention was given to the points behind the buckstays, in view of the fact that the cavity left between each setting came behind these. The cavities had been filled up at each end with cement; and as, in the event of any cracks developing, air was likely to be drawn in and lead to local combustion, it was necessary to be particularly careful. Finally, a careful examination was made of the whole of the settings, and any small cracks made good. The whole of the settings from top to bottom and over the whole of the top area were then washed down with a mixture of thin "Korktite" and lime. The front walls of the setting were also covered with a special insulating material for about eight feet down, to reduce radiation losses.

During the first month of gas making, a straight coal gas was made, and all heats were regulated and adjusted to give uniformity. The pyrometer used was the Cambridge and Paul disappearing filament instrument, which was found very suitable on account of its portability. The temperatures maintained were 1280° to 1300° C. Before commencing steaming, extraction was slowed down, and the bottom heats slightly increased by adjustment of the producer gas and secondary air, to give a lengthened flame. Steam was then admitted at 15 lbs. per sq. in. at the outlet of a reducing valve through a nipple with a ⅛-in. hole at the retort; the steam, after passing through the nipple, being delivered to the tubes previously mentioned, which distributed it on each side of the charge. Superheaters are fixed both in the main flue and in the flue below the check dampers. The superheater in the main flue is of the U-tube type. The whole of the steam service was well insulated with non-conducting material; and we are now enabled to maintain a steam temperature of 500° Fahr. at the inlet of the retorts.

Systematic analyses carried out with a Bone and Wheeler apparatus, showed that the nitrogen content of the gas was excessive, though there was not an abnormal quantity of oxygen present. This, with the fact that the carbon dioxide content was high, indicated that the bottom ironwork, which had not been removed, might be unsound; and, in order to confirm this, each setting was subjected to back pressure of 15 to 20 tenths, by partially closing the main off-take valve. This test was maintained until the whole of the ironwork had been examined; and it was found that air was passing through the interstices which had developed between the bottom castings and the first course of brickwork, also through slight cracks in the coke chambers. As it was impossible to remedy the former from outside, the joints were made good from inside with heat-resisting cement as each retort stood off for scurfing; and we then had greatly improved results. The cracks in the coke chambers were repaired by patching with steel and asbestos sheets. The steam pressure was gradually increased up to 37 lbs. per sq. in., which is the pressure now maintained, and the nitrogen content of the gas was still further reduced by reason of the increased volume of the gas at the lower end of the retorts reducing the excessive vacuum which previously existed there. Care was taken to keep the amount of water to the extractors and water-sealed doors at the minimum, to avoid cooling the hot coke zone by the wet steam formed, and the consequent effect upon the water-gas reaction.

We have found the reconstructed producers to be one of the greatest improvements on the old plant. The fronts are remarkably cool, a condition appreciated by the men engaged on fire cleaning. They are also most economical in working as compared with the old system of producers with false firebars, which were exceeding wasteful in fuel, due to the methods of cleaning. The percentage of combustible matter in the pan ashes is now very low. The fires are cleaned every four hours, and, in order to minimize the unavoidable leakage of fuel due to this work, the firemen are instructed to remove at each time of cleaning a specified quantity of ash from the ash pans. The removal of clinker is a comparatively easy matter, this being quite soft due to the diffused steam from the injector arrangement underneath the fire. By this means we have been able to reduce the percentage of combustible matter in the pan ash to 16 to 18 p.ct. The pan ashes are sampled and tested twice each week. On removing the covers of the producers when being filled with coke, care is taken to use a lighted torch, to avoid explosion and consequent shaking of the settings.

The actual time of filling each auxiliary bunker is strictly recorded by the top men, as a guide to the speed of travel of the coal in each retort. With certain classes of coal we experienced some trouble in regulating the travel, and in this connection we made the experiment of mixing small breeze with the coal (the quantity of breeze being equal to about 5 p.ct. of the coal) on its way to the storage bunkers. While this undoubtedly assisted the travel of the charge, it had a tendency to produce a smaller coke, owing probably to the prevention by the breeze of complete caking of the coal. Incidentally, analyses of the gas showed an improved hydrogen and carbon monoxide content, which may be due to the coke presenting a greater surface and longer time contact for the decomposition of the steam. The experiment was discontinued after a time, owing to the scarcity of breeze; but the results are interesting, and we hope shortly to experiment further on these lines. It is suggested that this idea may be useful in connection with the use of Durham and certain classes of Yorkshire coal, which often give trouble when carbonized in vertical retorts.

The coal used at present is proportioned at 80 p.ct. washed nuts and the remainder screened coal and beans. Spot and weekly bulk samples are analyzed, the average composition being:

	P.Ct.
Moisture	3·3
Volatile matter	31·2
Fixed carbon	60·4
Ash	5·1

The gas yield varies between 16,000 and 17,000 c.ft. per ton of a calorific value of 455 B.Th.U. gross. An analysis of the gas is:

	P.Ct.
CO_2	4·6
O_2	0·4
HC	1·6
CO	13·3
CH_4	21·4
H_2	49·4
N_2	9·3
	100·0

From my experience there seems no doubt that a vertical-retort plant is exceedingly sensitive to the slightest changes in conditions; and to obtain full efficiency, close supervision is essential. Various classes of coal behave very differently during carbonization; and on this account the correct mixing of the various kinds of coal found most suitable becomes an important item. It is desirable to endeavour to maintain uniformity from day to day, to avoid the necessity for frequent changes in the speed of extraction. Scurfing should be carried out at periods of not longer than six weeks, and care must be taken to examine and clean out inside the retorts the steam admission nozzles on either side. Any stoppage in these nozzles interferes with the admission of the full quantity of steam and its even distribution through the charge. To prevent hanging charges, it is essential that the heats should be so controlled that the carbonizing of the charge is allowed to become well advanced in the upper portion of the retorts. Further, this ensures the most suitable conditions for the steam reaction at the lower part of the retorts.

Rapid tests of spot samples of the crude gas for CO_2 and O_2 drawn from individual retorts or settings are very useful. These constituents of the gas provide a fairly reliable guide as to the water-gas reaction on any particular section of the plant, and an indication as to whether top or bottom leakage is occurring. The selection of men to operate a vertical-retort plant is, to my mind, a very important point. Conscientious men are of great assistance towards economic working, and, being constantly on the plant, are often able to report valuable observations. Cleanliness of the plant is in itself an aid to efficiency, and is usually appreciated and practised by such men.

In conclusion, I should like to acknowledge my indebtedness to Mr. J. W. Allin, whom I have the privilege to serve, for his kind permission to include in these notes the information concerning the plant at West Bromwich.

Discussion.

The Chairman congratulated Mr. Sylvester upon the completeness of his paper.

Mr. C. F. Tooby (Coventry) said the paper was distinctive and informative, in that it recorded failures as well as successes. He regarded this as most important to junior members, because it indicated things to be avoided. He agreed as to the great advantage to be derived by the use of silica in the construction of retorts. There was no doubt that material high in silica was coming to the fore. It effectively withstood high temperatures for a long time. In his district such retorts had been continuously at work for six years, and had retained their shape very well. They were experimenting with a setting constructed entirely of silica. As to the introduction of air by steaming jets, he would like to know if there was any difficulty in accurately adjusting the air supply. A common experience was hindrance from an accumulation of scale.

Mr. E. H. WRIGHT (Wolverhampton), speaking of the steam injection of the primary air, wondered if this was as efficient as it might be. His experience with horizontal settings proved it to be erratic. Nevertheless, it was an improvement upon the old method of admitting primary air through the clinkering doors.

Mr. C. F. W. RENDLE (Redditch) thought Mr. Sylvester and his fellow workers had overcome their difficulties very well. He agreed that it was equally important that they should know the reasons of failures as well as of successes. Silica was a refractory material preferable to fireclay. Owing to the difference in the coefficients of expansion of silica and fireclay, there was an element of risk in the use of a composite material.

Mr. A. R. MYHILL (Birmingham) suggested that the provision of an orifice meter for regulating the steam to the retorts was desirable.

Mr. W. J. PICKERING (Nechells) said the paper was a worthy effort on the part of one of their younger members. Such contributions should be encouraged and supported. He pointed out that in general working the admixture of breeze with coal was impracticable. He agreed, however, that it might be useful in certain circumstances. Fine Durham coal might possibly be improved by such procedure. It was difficult to ensure the proper distribution of steam to each individual retort. Something was wanted in addition to the ordinary pressure gauge. The meter suggested might be very useful, especially in 7-ton retorts.

Mr. G. E. CURRIER (Smethwick) said his experience with regard to the secondary-air flues coincided with that of Mr. Sylvester. They cut out the water from the furnaces, and depended upon steam to keep them cool. The use of silica enabled them to maintain high temperatures without trouble.

Mr. SYLVESTER, in reply, pointed out that no difficulty was experienced in keeping steam constant at the nozzles. The throughput was 4 tons 8 cwt. to 4 tons 10 cwt. per retort. No trouble was caused by pitching.

[A paper on "Consumers' Complaints," with which Mr. H. PERCY followed, is held over.]

LUBRICATION OF WORKS PLANT.

DISCUSSION ON MR. W. T. KENSHOLE'S PAPER.

The paper on the above subject presented to the London and Southern District Junior Gas Association, on Feb. 22, by Mr. W. T. Kenshole, of Lea Bridge, was published on pp. 490-1 of last week's "JOURNAL." An informative discussion took place.

Discussion.

The PRESIDENT (Mr. Walter Grogono, Gas Light and Coke Company), remarking that this was the author's first paper before the Association, congratulated him upon the thorough manner in which he had dealt with his subject, and also upon his good fortune in being with a Company who looked after an item of detail in the way described in the paper. Mr. Kenshole began by stating that the correct grades of lubricant should be employed. Here he had hit the nail right on the head. Get the correct oil, and apply it in the proper manner, and the money aspect would be all right. Then he went on to tell them that all cans should be distinctly labelled. It was, of course, no use having the oil carefully sent out by the storekeeper, and then letting the man in the engine house pick up the nearest can, without taking the trouble to see that he had got the right one. With regard to the statement that the feed varied with the change of temperature in the engine room, personally he (the President) did not consider that changes in temperature would affect the oil very much. Such changes were not very great in a room in which engines were running. It seemed to him that leaving tar and liquor pumps out in the open was asking for trouble. They should all be housed somewhere, and if possible all together. If they were in the engine house, the driver had them under his eye the whole time, and so it was always possible to get to the man who was responsible for lubricating them. He took it that at the end of the month the total oil issued was added up, and then balanced against the stock. Did the two balance, because in every case he (the President) knew of, this was not the case? If one had a gallon can of oil, the next time it was filled one did not get a gallon into it; thus there was always a surplus in the stores. With regard to the chart showing the monthly consumption of oil per million cubic feet of gas made, he had been wondering whether this was a fair way to take it. If the resulting figures were used for comparing one works with another, then he considered it was not a fair basis to adopt. He had tried in the case of one works to plot the oil on Mr. Kenshole's chart, but could not do it. On only three occasions did he get his line on to that chart at all. Had Mr. Kenshole had any experience with graphite? His (the speaker's) had not been encouraging. He had met with some very high-priced graphites, but they all contained a certain amount of carbon, and the wear had been excessive.

Mr. E. E. CALVERT (Gas Light and Coke Company) said it was by going thoroughly into matters of detail such as this that it was possible to increase the efficiency of a station as a whole. As the author had said, there were no doubt advantages attached to the new form of contract he had outlined, but it seemed that there were disadvantages too. In the summer the output of gas was probably only one-half what it was in the winter, but the oil requirement in the summer would not be half that of the winter. In a case he took, there was a difference of 0·5 gallon per million cubic feet of gas made. He did not know whether the contract would be based on the summer make or the winter make. If on the summer make, he doubted whether the contractor would be able to supply mechanical lubricators and filters, and pay a bonus at the end. He would have liked to hear more about graphite as a lubricant. One particular part of a gas plant required a good deal of attention, and that was the levers of the retort lids. If one used oil, with a very high temperature it was found that the lever became stiff, and in some cases had to be hit hard with a hammer to move it. At his works, the experience had been that graphite, mixed with cylinder oil, formed a very good lubricant for these levers. The cylinder oil dried away, and left the graphite surface for lubrication.

Mr. D. J. WINSLOW (Lea Bridge District Gas Company), referring particularly to gas-engines, remarked that the author had shown them that lubrication required close attention, so that they could see exactly what went on. The author said it should be borne in mind that a temperature of between 2000° and 2650° Fahr. was developed at the instant of explosion in the cylinder. He believed Sir Dugald Clerk gave the temperature as from 1800° to 2000° C. In the case of small gas-engines working on the district, the tendency was to over-lubricate with the oil can. It was necessary, too, to watch compressors on district work, to see that they were not over-lubricated. If they were, oil was liable to get into the pipes and stop-up the very small nipples of burners and appliances.

Mr. F. J. PEARCE (North Middlesex Gas Company) said they were particularly indebted to the author, inasmuch as he had given them a paper on a subject which suffered from a good deal of neglect. He had never come across another paper, read before a Gas Association at any rate, which dealt with lubrication. It was an important question. Mr. Kenshole was quite right when he spoke of securing the proper grade of oil for particular work. Generally, he (the speaker) had found in his own experience that it was the highest-grade oils, and therefore probably the oils which cost most per gallon, which gave the greatest efficiency, and were the cheapest in the long run. Consequently, it did not pay to go running about to save 1d. or 2d. per gallon on oil. The President had asked for some experiences with graphite. Well, some years ago he (Mr. Pearce) had been able to effect a very large saving by substituting grease cups in certain cases, and using graphite grease instead of oil. The same quality of graphite grease had now been used for years, and it was excellent in every respect. He agreed with the President's remark that possibly the basis taken by Mr. Kenshole in his chart and table was not a fair one upon which to compare one works with another. His own figures for 1923 had been worked out in gallons per million cubic feet of gas made. He had not been in the habit of doing this, but had previously always taken the oil in stock at the beginning of the year, added the oil and grease bought, deducted what was in stock at the end of the year, and then worked out the total cost of lubrication. For last year the cost was 4s. 11·65d. per million cubic feet made; and seeing that the average cost of oil was 2s. 4d. per gallon, this represented a shade over 2 gallons per million, as compared with the author's 3·95. He did not know whether this was a fair comparison as between one works and another; the difference was very big. As a matter of fact, it was very nearly one-half, and he would like if possible to find out exactly where this difference arose.

Mr. D. C. CROSS (Lea Bridge) added his meed of praise to Mr. Kenshole for his effort on behalf of the Association. As to comparing one works with another in respect of lubrication, he was absolutely convinced that it was impossible to do this on an equitable basis, and no oil company would quote for one works on the basis of the experience which they had gained with another. It was utterly impossible. They had only gone on the oil, but what about the grease? Some people were mad on grease, while others would use only oil. Again, the oil used on the water-gas section of a works was a very small item compared with that required for the coal-gas section. He had an idea that Mr. Pearce's water-gas percentage was high. It also made a difference whether or not a plant was working up to its full capacity. In the matter of graphite his own experience had been fairly happy. At his works they started using it in connection with the vertical retorts, where the lubricators were at different heats. It was found that if the same grease was put into all the cups, trouble arose. However, they got down to three grades of grease for different cups, and now they had managed to reduce this to two. It required watching, but graphite must not be condemned until they really knew all about it. He agreed that graphite mixed with oil for lids was an ideal arrangement.

Mr. H. W. KERRIDGE (Croydon) pointed out that a proper oil film in internal combustion engines was most important. The whole thing depended upon the quality of the oil.

Mr. J. H. GOLDSMITH (South Suburban Gas Company) asked the author what he did with the recovered oil.

Mr. LEONARD LACEY (Gas Light and Coke Company), referring to the distribution of oil from the stores, inquired whether the author had any system of rationing oil. That was a very good method, but it needed to be used with discretion. He had known cases of engine drivers, who had unfortunately run out of oil, resorting to a very poor substitute in order to try and keep the engine running. It was well therefore to have some reserve which might be got at when the store was not available. Mention had been made of the varying capacity of a can according to the quantity of oil left in it. It was rather good practice to have an appliance, such as could be obtained now, by which an absolutely fixed quantity was obtained. In connection with the lubrication of retort lid levers, Mr. Calvert had stated that a mixture of graphite and oil was used, and Mr. Cross had expressed the opinion that the addition of graphite to the oil was good. Personally, he would advise them to leave out the oil. If they took a mixture of graphite and water, and dipped the lever in while hot, a film of absolutely dry graphite would be obtained, and he found this better than any kind of oil. He agreed with what had already been said on the matter of comparison. Certainly the only rational method was the cost per million cubic feet of gas made.

Mr. T. H. PRATER (Tottenham) thought that the storing of barrels under cover was a very important point. Oil was often seen stored in the open, and when the rain got on the wood it dissolved the glue, which might have undesirable effects. Nothing had been said about works locomotives, which seemed to receive very little attention. Very often only one kind of oil was used on a locomotive for all purposes. He thought that some marine engines went for a considerable time without any lubrication, after they had been treated with graphite. With reference to the use of oils, after they had been passed through the filter, oils ought always to be employed for the particular purpose for which they were intended.

Mr. C. J. SAUNDERS (South Metropolitan Gas Company) asked whether the author thought a barrel represented the ideal as a means

of transporting lubricating oil. Also, had he any information as to the efficiency of mechanical filters and separators?

The President said he had been referring to graphite lubrication as applied to engines. For hot retort levers he believed it might be useful in some form—he was inclined to think without the oil. As to his being unable to get on to Mr. Kenshole's chart, he might say that the lowest figure he had for 1923 was 1·11 gallons, and the highest 2·16 gallons. He did, however, agree that it was unfair to compare any two works, unless one knew the whole of the local conditions.

Mr. Kenshole, in the course of his reply to the questions raised in the discussion, said that perhaps the temperature in an engine room might not vary very much; but it was not altogether a question of the general alteration of temperature, but as to whether a particular lubricator was more or less in a draught. There was no doubt it paid to cover all tar and liquor pumps. As to balancing the oil stocks, the lighter the oil the nearer one got to a correct figure. But the reliable way of doing it was to take stocks, and not to go so much by the book. The book was only used really for purposes of control. No two works could be compared, and gallons per million cubic feet made was not the fairest way of doing it. Cost was the proper method to adopt. As to Mr. Winslow's question regarding 2000° C. or 2000° Fahr., a booklet he had with him said 2000° to 2630° Fahr. For the actual compression chambers of compressors one needed a special class of oil, and the lower the consumption could be kept, within limits, the better. From what he knew, there was no doubt that the figures of oil consumption in connection with the lubrication of carburetted water-gas plant were very much lower per million cubic feet than for coal gas plant. It was absolutely necessary in all cases to use the correct grade of oil. They used the recovered oils for ordinary work. The oils were kept separate. The oil was not exactly rationed, but they found out what was an economical figure to and worked as nearly as possible to this. Some men used a lot more than others. It was very interesting to hear of the use of graphite and water for lever lids. They were using on their gas-engines compounded oils, and were getting very good results with them. Tanks would be better for transporting oil, if the scale of consumption warranted the adoption of this method. He could not give figures as to the efficiency of filters and separators.

The author was heartily thanked for his paper on the proposition of Mr. W. Newton Booth (Woolwich Arsenal), seconded by Mr. J. K. Grant (South Suburban Gas Company).

DEVELOPMENT OF PRODUCER-GAS FIRED FURNACES.

A Meeting of the Birmingham Metallurgical Society was held at Wolverhampton on Feb. 28, when Mr. T. Teisen, B.Sc., gave a lecture entitled "Notes on the Development of Producer-Gas Fired Furnaces."

Mr. Teisen said that producer-gas fired furnaces had been used extensively in certain industries for many years. They had lately been given a new life by being adopted for other purposes, on account of their economical working and other advantages. They might be classified, according to their construction, into those having their own producers and those connected with central producers; or, according to their working method, into regenerative furnaces in which the secondary combustion air was pre-heated on the intermittent system introduced by Siemens, recuperative furnaces in which the secondary air was pre-heated on the continuous system, and, last, those without heat recovery. With the aid of lantern slides the lecturer described the workings of these different types, including examples from the iron and steel, metal, enamelling, and glass industries. Gas firing, he said, had been introduced into these industries in Germany, France, Belgium, and other European countries, and in America, replacing the less economical direct fired and other furnaces. In this country they had been introduced for most purposes, but only to a slight extent.

Mr. D. H. Ingall, proposing a vote of thanks to the lecturer, said that metallurgists used more types of furnaces than did any other industry. Unfortunately, in putting down a furnace, manufacturers often failed to give the same consideration to suitability for the purpose as they did with other portions of their plant. Mr. L. Nettleton referred to the small type of furnaces used in the nut and bolt and other industries in the district. In these, coke, town gas, and fuel oil were found most economical. With producer gas they could not get the necessary speed of working. He agreed as to the importance of adapting the type of furnace to the object in view. In the Midlands they often found an expensive plant installed which failed to give its full results, owing to the fact that it was used with already existing furnaces which had not been designed for the operation. Mr. Specker spoke from experience of the use of gas-fired furnaces for small forgings, and of their advantages over furnaces using solid fuel. Town gas for large furnaces, he declared, had been found satisfactory.

Mr. Teisen, in reply, said that for many metallurgical purposes producer-gas fired furnaces could be used with advantage. Generally, it was desirable to have the recuperation close up, but this was not so great an advantage as to have the regeneration close up. For annealing and many other purposes, it was, of course, an advantage to have one central producer plant. The facility with which the heat could be regulated and applied as desired was one of the great recommendations of gas firing. For nut-and-bolt and other small work, one could get nothing more efficient than a furnace fired with oil or coke. A gas-fired furnace had to be run at a very high temperature in order to get the intense radiation that could be secured from a coke fire.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

All-Gas Houses.

Sir,—Arising out of recent correspondence in the "Journal" upon this subject, it is often said that gas is too expensive to be used as the sole agent for supplying the whole of one's domestic requirements. In this respect it is possible that my personal experiences may be of interest to your readers. I have an all gas house, this containing two gas-fires of the "St. Nicholas" type for dining-room and drawing-room (both of which rooms are on the large size), five bedroom gas-fires of ordinary "Metro" design, one gas-cooker, one gas refuse destructor, one Clark's gas syphon stove, one gas-heated hot-water circulator (Potterton), and twenty lighting burners. I have no coal fires, and use no electricity.

Unfortunately, I cannot give a full year's figures, as I came into the house on April 5, 1923, and therefore those below cover three quarters only:—

Period from	Therms Used.*		£	s.	d.
April 5 to July 4	202	8d. per therm†	6	14	8
July 4 to Oct. 4	136	8d. ,, ,,	4	10	8
Oct. 4 to Jan. 3, 1924	405	8d. ,, ,,	13	10	0
			£24	15	4

* 560 B.Th.U. quality. † Present price.

Assuming that the current quarter will amount to the same as for last quarter—and the consumption to date (284 therms) indicates that this will be approximately correct—the annual cost will be £38 5s. 4d. for gas alone.

It is true that there are only three, and sometimes four, persons living in the house, but there is certainly no stint placed upon the use of gas. At least two or three hot baths are required every day; and the fires in both the dining-room and the drawing-room, which are in constant use, are not of the most economical type, although they make a special appeal to people who would not be content with the ordinary type of gas-fire for sitting-room use.

That much labour is saved by this complete use of gas goes without saying, and it would appear to me that it is practicable for a considerable section of the public to look upon all-gas houses as quite within their means.

G. M. Gill.

119, *Victoria Street, S.W. 1, Feb. 28, 1924.*

REGISTER OF PATENTS.

Gas-Meters.—No. 209,855.

Simpson, S., of Newton Abbot.

No. 28,934; Oct. 24, 1922.

This invention relates to station meters of the wet type, and has among its objects to provide a meter in which the bearings of the spindle of the rotating drum or measuring chamber may be effectively lubricated and readily examined and repaired. Accordingly, the spindle of the rotating drum is extended so that the bearings, preferably of the ball or other antifriction type, may be arranged in water-tight chambers.

The chambers carrying the bearings are arranged one in the front plate of the meter casing, and one in the spout or inlet connection at the rear of the meter. This inlet spout has a tube formed in the centre, so that the spindle may be carried to the outside of the spout. The chambers are so formed that they can be filled with grease or oil, and a cup leather of the hydraulic type or a gland is provided to prevent the escape of oil or grease into the interior of the meter, and the entrance of water into the bearing chamber. Pneumatic or spring pressure is provided, so that the pressure on the grease is greater than the pressure of water from the interior of the meter. Metal or glass covers are provided on the bearing chambers; and hand or mechanically operated pumps may be provided for maintaining pneumatic pressure on the grease.

Suitable gearing is provided in one of the bearing chambers, and a spindle working in a gland or leather cup is carried from the chamber to the recording index mechanism. The inlet spout or connection is so arranged as to be detachable without removing the front plates of the meter.

Gasifying Fuels with High Volatile Contents. No. 209,955.

Baskerville, C. H. V., of Salisbury, South Rhodesia.

No. 2755; Jan. 30, 1923.

This invention relates to a plant designed to deal with bituminous and non-bituminous fuel, and is characterized in that the disadvantages that have hitherto made themselves apparent with both the single and double (or up and down) draught producers have been eliminated, while the special advantages of each have been retained, together with some special features.

The invention is directed to the kind of up-draught gas producer wherein the tar, which is of the highest calorific value, is gasified, and the volatile matter drawn away from the coal which is being coked. The producer has (1) only one fire, and that on the grate, thereby preventing the volatile matters passing out of the producer unconsumed, distillation being under complete control, in that the fire is not swamped with damp or highly-volatile fresh fuel; and (2) a container, that part of which under the hopper or the like is enlarged to form a retort heated by the flow of hot gas, the tar and other volatile

matter thereby driven off being withdrawn by suction and passed through the fire, where they are consumed, thereby providing additional gas.

The patentee claims: An up-draught gas-producer of the above nature characterized (1) in that the producer is constituted by a cast-iron base set in a water seal, a vertical shell mounted on the base, a cover to the shell, a retort with a trunk large in proportion to the size of the producer and extending downwardly therein, a baffle extending half-way round the trunk, a gas outlet located above the baffle, a distributor with inlets opening into the base, a fan and pipe connection coupling-up distributor and the upper part of the retort, a firegrate consisting of vertical standards supporting a circular deadplate, and an annular space between the deadplate and the inner circumference of the lining of the shell; (2) in that the water heater, or the gas outlet pipe, is fitted with a flap valve, so that dust and grit can be drawn to a down pipe for removal at the water seal during the working of the producer; and (3) that the vaporizer is provided with a spiral coil on the gas outlet pipe, to allow the drip to travel downwards in contact with the hot surface till evaporated, the pipe also carrying a tray to hold a surplus of water.

Handles for Cooking Utensils.—No. 209,992.

THE GAS LIGHT AND COKE COMPANY, and HOLT, E. C., both of Horseferry Road, S.W. 1.

No. 8517; March 26, 1923.

This invention provides a detachable handle for use with cooking utensils. It is stamped from sheet metal, and bent to the shape of the pan to be fitted, so that the claw-shaped end extends beneath the pan and the inclined portion (when the handle is slipped into place) is embraced by a loop on the side of the pan.

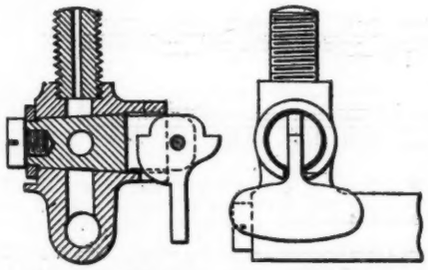
Thus one handle may serve for several pans, and for loops at the ends or sides of utensils; and, furthermore, the latter will pack into one another for transit, instead of being encumbered with rigid handles.

Gas-Taps.—No. 210,026.

RADIATION LIMITED, and BAYLEY, C. S., both of Birmingham.

No. 20,961; Aug. 17, 1923.

This invention relates to a security gas-tap, of which we reproduce a sectional side elevation and an end elevation showing the plug locked in the closed position.



Bayley's Gas-Tap (Messrs. Radiation Limited).

It will be seen that the outer end of the tapered rotatable plug is slotted, and that a flat finger-piece is hinged therein. This finger-piece has lateral projections, either of which will fall into a slot and lock the plug when the latter is in the closed position; while shoulders are formed in the projections to permit rotation when the finger-piece is raised.

Incandescent Burners.—No. 210,020.

FISK, J. W., of Cardiff.

No. 16,918; June 29, 1923.

This invention refers to inverted burners of the type in which a diaphragm chamber is arranged a short distance above the burner head, for the purpose of breaking up and preheating the stream of gas and air.

The specification describes a special form of diaphragm, rectangular in plan and with corrugations designed to impart a swirling motion to the mixture before it proceeds to the burner head by way of gaps cut out of the sides of the diaphragm.

Benzole Recovery.—No. 210,114.

AGUILLON, J. E., of Paris.

No. 25,377; Sept. 19, 1922.

This invention relates to a process of recovery of benzole from coal gas, by which only 4 grammes of benzole are left per cubic metre of gas.

The gas under treatment is sent in the first place into a condenser wherein it is cooled to about 0° C. This condenser serves for the condensation of the greater part of the water and the naphthalene, and it may consist of an upright chamber or column with Raschig rings in which a cooling liquid is caused to descend, or of a set of tubes cooled by the evaporation of a liquefied gas. The gas is then sent through a heat exchanger, and then round a set of tubes constituting the benzole-removing device and cooled in the interior to −50° C. by the expansion of liquefied carbonic acid.

The benzole, which condenses in a snow-like mass upon the set of tubes, is removed by mechanically operated scrapers, and drops to the bottom of the receptacle. It can readily be removed in the solid state, or in the liquid state by maintaining the lower part of the receptacle at a temperature slightly above 0° C. After leaving the benzole-removing device between −30° and −40°, the gas returns to the heat-exchanger, wherein it becomes heated at the expense of the ingoing gas.

The heat-exchanger may be constituted by two chambers or columns with rings of the Raschig type, and a cooling effect between them is obtained by circulating a calcium chloride brine (in a manner known in the art of refrigeration).

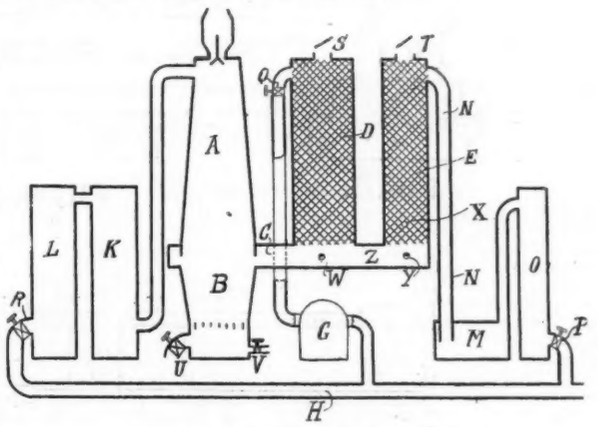
The patentee claims that the process can be economically employed even for the treatment of small quantities of gas, since it requires only the power necessary to drive the carbonic acid compressor used for refrigeration, and obviates the use of oils and steam.

Two-Stage Manufacture of Gas.—No. 210,356.

TRAVERS, M. W., of Highgate, and CLARKE, F. W., of Lymm.

No. 16,960; June 29, 1923.

This invention is a modification of that described in specification No. 198 777 [see "JOURNAL" for July 18, 1923, p. 312]. It will be remembered that in that invention some of the gas leaving the upper part of the carbonization chamber during the run is forced through a regenerator which has been previously heated by the blow gas, and the gas so heated is delivered to the lower part of the carbonization chamber. According to the present invention the gas manufactured is enriched by passing a portion of it, which has been regeneratively heated, through a chamber which has been heated by the blow gases and into which a hydrocarbon oil is introduced.



Two-Stage Manufacture of Enriched Gas.

The invention is illustrated by the accompanying drawing, which is a diagrammatic view of the plant. In this diagram, A is the carbonization chamber, and B the gasification chamber. C is a passage through which the blow gases pass from B to the bottom of a regenerator D filled with brick chequer-work and provided with a stack valve S and a secondary air inlet W. U and V are valves for admitting air and steam respectively beneath the chamber B. During the run, gas passes from the top of chamber A through a scrubber K and condenser L past a valve R to the main H, which leads to the gasholder. From a convenient point in the main H, a by-pass leads to a circulator G adapted to force some of the gas from the main past a valve Q to the top of the regenerator D. E is the enriching chamber which, like the regenerator, is filled with brick chequer-work and communicates by a passage Z with the regenerator D at any convenient level. If preferred, the passage Z may communicate directly with the passage C. In the bottom of the chamber E is a secondary-air inlet Y, by which air can be introduced to complete the combustion of the blow gas as it passes up from the chamber E to the stack valve T. X is a sprayer by which oil can be introduced into the chamber E, from the top of which a pipe N leads to a wash box M, from which the enriched gas issues to a cooler O, and so through a valve P to a point in the main between the intake of the circulator G and the gasholder. In operating the plant, the valve P, Q and R, are first closed, the stack valves S and T and the air-blast valve U are opened, and air is blown into B till the temperature is raised sufficiently for the production of water gas by subsequent steaming. During this operation the blow gas, containing carbon dioxide and carbon monoxide, passes through the channel C, and is distributed through the vessels D and E in proportions which can be regulated by restricting the openings of S and T. Secondary air may be admitted at W and Y. Thus, the temperatures to which the vessels D and E are raised during the blow period can be controlled and regulated. At the end of the blow period the secondary air is cut off at W and Y, and the air blast valve U is closed. The steam valve V is opened, stack valves S and T are closed, and the valves P and R are opened. The circulator G is set in motion, the valve Q is opened, and oil is sprayed into E by the sprayer X. The water gas generated in B passes upwards through the coal in A, and, with the gas produced by the distillation of the coal, passes through the scrubber K and the condenser L to the main H. Some of this gas is forced by the circulator G to the top of the regenerator D, and passes through it, being heated in the process. The stream of gas divides at the bottom of the regenerator. Part of it enters the bottom of the carbonization chamber A, through the channel C, and part of it passes through the channel Z into the bottom of the carburettor E, and flows upwards, together with the sprayed oil, which, in contact with the hot brickwork, and by the action of the hydrogen in the gas, is

converted into permanent hydrocarbon gas. The enriched gas passes through the pipe N, the wash box M, the cooler O, and the valve P to the main H; and, as the quantity of gas passing the valve P can be controlled, the quantity of gas entering the carburettor E is also under control.

Coke-Discharging Ram.—No. 210,240.

RIDE AND BELL, LTD., of Misterton, and RIDE, J. A., of Headon.

No. 33,731; DEC. 11, 1922.

This invention relates to the construction and operation of a rack-propelled coke ram for gas retorts. The ram is of the pivoted-section type, with rigid head.

According to the invention both the rigid head portion of the ram and its sectional continuation are formed from material comprising two side flanges and a central web—preferably rolled steel of the section known as "broad flange beam" (fig. 1.) The side flanges of the ram sections are notched or recessed on the upper side at each end (fig. 2); and links having shouldered or cranked ends (figs. 3 and 4) fitting such notched portions are secured along the upper edges of the side flanges, preferably flush therewith at the top. The ram sections are pivoted together by these shouldered ends of the links; and it will be appreciated that the engagement of the shouldered ends of the links with the notched portions of the flanges will reduce the shearing stress on the rivets when the ram is in operation. Further, such shearing stress is similarly reduced by the interlocking design of the link ends.

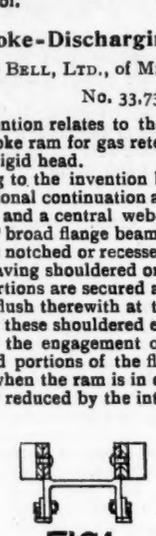


FIG. 1

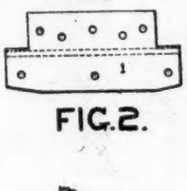


FIG. 2.

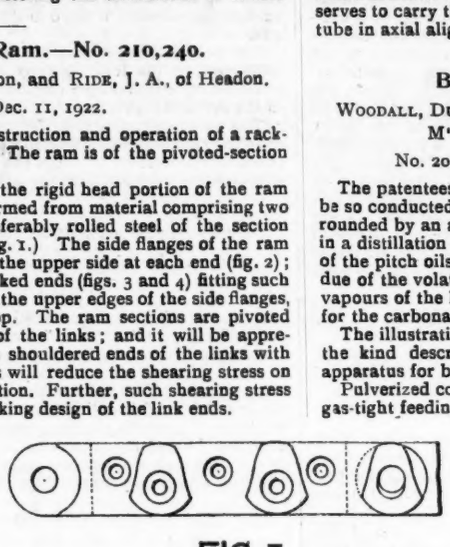


FIG. 3.

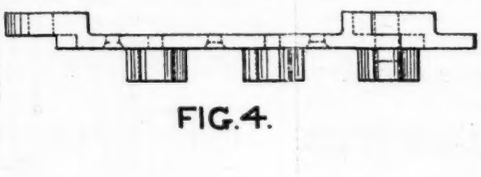


FIG. 4.

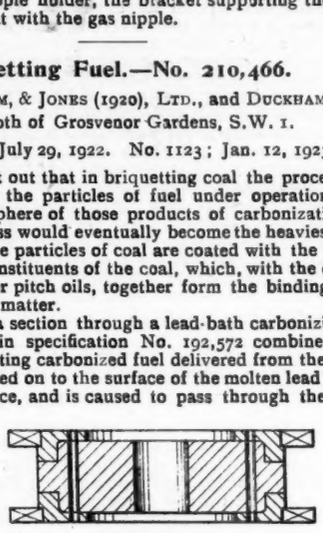


FIG. 5.

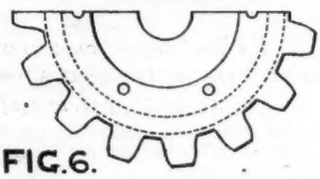


FIG. 6.

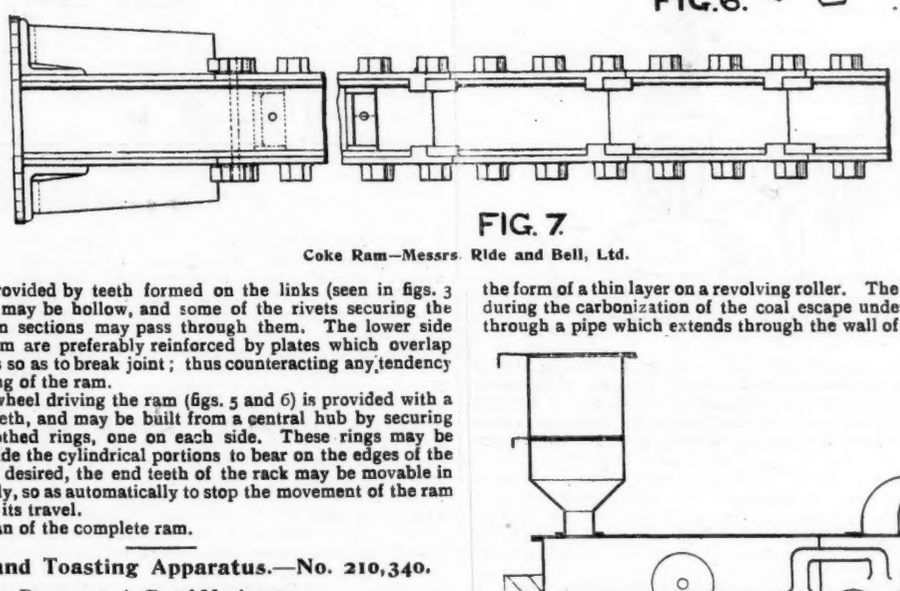


FIG. 7.

Coke Ram—Messrs. Ride and Bell, Ltd.

The rack is provided by teeth formed on the links (seen in figs. 3 and 4). These may be hollow, and some of the rivets securing the links to the ram sections may pass through them. The lower side flanges of the ram are preferably reinforced by plates which overlap the ram sections so as to break joint; thus counteracting any tendency to lateral bending of the ram.

The toothed wheel driving the ram (figs. 5 and 6) is provided with a double set of teeth, and may be built from a central hub by securing thereto two toothed rings, one on each side. These rings may be cranked to provide the cylindrical portions to bear on the edges of the ram flanges. If desired, the end teeth of the rack may be movable in one direction only, so as automatically to stop the movement of the ram at either end of its travel.

Fig. 7 is a plan of the complete ram.

Grilling and Toasting Apparatus.—No. 210,340.

ROXBURGH, A. B., of Monkseaton.

No. 13,021; May 15, 1923.

This invention relates to grilling and toasting apparatus comprising a drip tin or tray and a vertically adjustable grid which supports the meat, &c., to be grilled or toasted. The object is to provide an improved adjustable grid and means for supporting it in the drip tin.

This is effected by means of a pair of resilient handles on the grid. At the rear end the grid is adapted to engage one of a vertical series of supports, and at the front end the resilient handles normally engage one of a vertical series of pairs of notches, stops, or like supporting means.

Injector for Gas-Burners.—No. 210,301.

KEITH AND BLACKMAN COMPANY, LTD., and KEITH, G., both of Farringdon Avenue, E.C.

No. 5179; Feb. 22, 1923.

This invention relates to an injector device for gas burners, and has for its primary object to provide a construction that is inexpensive, but ensures correct formation and location of the venturi passage.

The venturi injector tube is constructed of two symmetrical stampings which are formed with longitudinal flanges and to which th proper concavity may readily be imparted in the stamping operation; the flanges of mating stampings being welded or otherwise secured together.

The inlet end of the injector is inserted into an externally screw-threaded coupling ring formed on its inner periphery with two diametrally opposed slots presenting key-ways engaged by the flanges. The ring is fitted into an internally screw-threaded aperture in a connection bracket or the like, to which is led the gas connection and which serves to carry the nipple holder, the bracket supporting the injector tube in axial alignment with the gas nipple.

Briquetting Fuel.—No. 210,466.

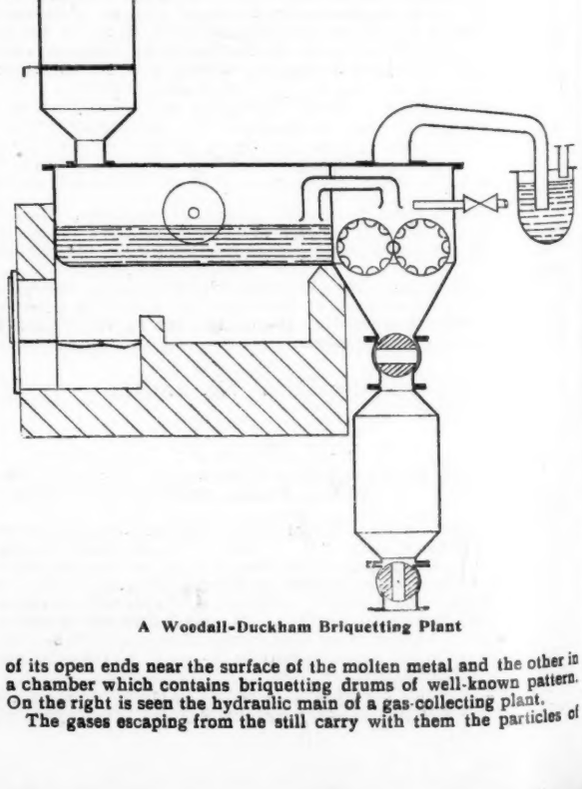
WOODALL, DUCKHAM, & JONES (1920), LTD., and DUCKHAM, Sir A. M'D., both of Grosvenor Gardens, S.W. 1.

No. 20,827; July 29, 1922. No. 1123; Jan. 12, 1923.

The patentees point out that in briquetting coal the process should be so conducted that the particles of fuel under operation are surrounded by an atmosphere of those products of carbonization which in a distillation process would eventually become the heaviest portions of the pitch oils. The particles of coal are coated with the final residue of the volatile constituents of the coal, which, with the condensed vapours of the heavier pitch oils, together form the binding material for the carbonaceous matter.

The illustration is a section through a lead-bath carbonizing still of the kind described in specification No. 192,572 combined with an apparatus for briquetting carbonized fuel delivered from the still.

Pulverized coal is fed on to the surface of the molten lead through a gas-tight feeding device, and is caused to pass through the metal in the form of a thin layer on a revolving roller. The elastic fluids evolved during the carbonization of the coal escape under their own pressure through a pipe which extends through the wall of the still and has one of its open ends near the surface of the molten metal and the other in a chamber which contains briquetting drums of well-known pattern. On the right is seen the hydraulic main of a gas-collecting plant.



A Woodall-Duckham Briquetting Plant

The gases escaping from the still carry with them the particles of

coal which have been carbonized by passage through the molten lead and deliver them to the briquetting drums, contact with which cools the particles so that while they are being compressed into briquettes they condense on their surface the heavier constituents of the vapours carried by the gases. The formed briquettes fall from the drums to the bottom of the chamber. In order that they may remain out of contact with air until sufficiently cool, the briquettes are passed into a cooling chamber.

The nature of the matter which condenses on the carbonized particles depends on the character of the coal and the temperature of the lead bath. When the condensate is sufficiently bituminous, it will serve to bind more particles than those delivered from the still; in this case finely subdivided coke may be fed to the briquetting drums through the supplementary pipe on the right.

Purifier Grids.—No. 210,616.

SPENCER, J. A., of Southall.

No. 2029; Jan. 23, 1923.

This invention relates to an improved construction of flat grid and supports, for the material in gas purifiers.

According to the invention, each grid comprises one or two flat rows of bars, composed either of mild-steel channel, angle, or T bars, or of rectangular wood laths, or a combination thereof. These bars fit loosely in recesses in one side of a single row of cross-bars, or in the corresponding sides of superimposed cross-bars, carried by joists resting upon separate pillars. The bars relatively are staggered throughout the purifier; and in the grid with two rows of bars the space between the rows will serve as a distributing agent for the gases filtering through.

The grids thus formed are supported by mild-steel channelled or the like bars, the flanges of which fit within corresponding recesses formed in the top of suitable pillar supports. The pillars supporting each superimposed grid rest upon the support bars immediately over the corresponding pillars of the grid below.

It is pointed out that the grids may be constructed in convenient sections; but the patentee recommends "the loose construction, built up piece by piece," as "the most economical and stable; the parts readily fit the positions to which they are assigned, and they are easily handled, and have a much longer life."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 27.]

Nos. 4093 to 4705.

ATKINSON, J. S.—"Gas-producers." No. 4367.
BATT, W.—"Dry gas-meters." No. 4346.
BOUGHTON, H. F.—"Manufacture of coal-gas." No. 4523.
CAIRNS, R. M.—See Batt, W. No. 4346.
CHANCE BROS. & CO., LTD.—"Gas-measuring apparatus." Nos. 4687, 4688.
CHEMICAL ENGINEERING & WILTON'S PATENT FURNACE CO., LTD.—"Manufacture of sulphate of ammonia." No. 4397.
DEMPSTER & SONS, LTD., R.—"Regenerator furnaces." No. 4545.
HUMPHREY, H. A.—"Manufacture of combustible gases." No. 4649.
LAKE, W. H.—"Means for measuring flow of fluids." No. 4272.
M'LUSKY, W. B.—"Register stoves, &c." No. 4406.
MICHALSKI, R.—"Coke loaders with vertically-movable shovels." No. 4289.
RICHARDS, S. W.—"Joints for pipe mains." No. 4555.
SELAS AKT.-GES.—"Gas-burners." No. 4662.
STEIN & ATKINSON, LTD.—See Atkinson, J. S. No. 4367.
SYNTHETIC AMMONIA & NITRATES, LTD.—See Humphrey, H. A. No. 4649.
TOOGOOD, H. J.—See Dempster & Sons, Ltd., R. No. 4545.
VIDAL, A. E.—See Selas Akt.-Ges. No. 4662.
WILSON, J. H. and WILSON GAS-METERS, LTD.—"Coin-freed mechanism." No. 4237.
WILTON, N., and T. O.—See Chemical Engineering & Wilton's Patent Furnace Co., Ltd. No. 4397.
WOODALL-DUCKHAM (1920), Ltd.—"Centrifugal separators." No. 4401.
WRAITH, H. O.—See Chance Bros. & Co., Ltd. Nos. 4687, 4688.

Swansea Gas Light Company.

The 95th annual meeting of the Company was presided over by Mr. E. H. Leeder (the Chairman), who said they had had a successful year. The expenditure on revenue account was roughly £24,000 less than in the previous year, while the receipts were some £10,000 less. A decrease in the price of gas, as from the September meter readings, of 1·8d. per therm, or 8·1d. per 1000 c.ft., resulted in a reduction of revenue from gas sold during the December quarter of £6717, and represented over twelve months a saving of £23,060 to the consumers. The charge to-day was 2·4d. per therm less than the basic price, and in accordance with their Act they had been able to make further allocations to the co-partnership fund and reserve fund. The number of co-partner employees was now 281, and £2277 of the Company's stock was held by them. The capital expenditure during the year amounted to £136,418. Practically the whole of this was in respect of work done on the Morriston site, and on the high-pressure steel main connecting the Oystermouth Road Works and the Morriston Works. This main had been in use for some little time past for sending gas into the 2 million c.ft. holder at Morriston. As to the new works, contracts had been placed for practically all the necessary plant for the manufacture of coal gas and its purification, registration, and storage. It was hoped to commence gas-making at Morriston during next autumn. A superannuation scheme had been established, and was in effective operation. The report and accounts were adopted, a dividend at the rate of 5 p.ct. per annum upon the ordinary stock was declared, and a vote of thanks was passed to Mr. W. H. Johns (the Engineer and Manager) and the other officers and staff.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Rhymney and Aber Gas: The Standing Orders applicable to this Bill having been complied with, it was read a second time, and committed.

HOUSE OF COMMONS.

Gas Regulation Act.

In the House of Commons on Feb. 26, on the motion of Mr. Albert Alexander, it was resolved that the Drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act, on the application of the following gas undertakings, be approved: Accrington District Gas and Water Board, Bedford Gas Light Company, Brentford Gas Company, Hyde Gas Company, Nelson Corporation, Tynemouth Gas Company, Uxbridge, Wycombe, and District Gas Company, Wolverhampton Gas Company, and the Yorktown and Blackwater Gas Company. The Special Order for the Eastbourne Gas Company was also approved, with the following addition for the protection of the Eastbourne Corporation:

> The provisions of section 20 of the Act of 1909 shall extend and apply to any works of the Company in the Borough of Eastbourne executed under the powers of section 32 of this Order.

Smoke Abatement.

Replying to Mr. Birchall, who asked the Minister of Health whether he proposed to take any steps to deal with the smoke nuisance in large cities, Mr. GREENWOOD said the question of introducing legislation was receiving consideration.

LEGAL INTELLIGENCE.

Gas Employee's Theft of Gas.

The ingenuity of a gas company's employee to obtain gas without paying for it was told at Exmouth Petty Sessions, when Charles Gibbings, of Lympstone, pleaded guilty to stealing gas and causing wilful damage to a pipe. Mr. M. D. Thomas, representing the Exeter Gas Company, said Gibbings, an employee of the Company, was a consumer of gas by a slot meter. He made a connection with the service pipe, whereby the gas would pass direct to wherever it was required, and not go through the meter. The lime ashed floor had been scraped away and sacking substituted over the T-piece, where a connection was made. Mr. W. E. Dean (the Manager of the Company) and Mr. Avery (one of the collectors) detected a strong smell of gas at accused's house. Mrs. Gibbings had pulled away the connecting tube, but had no time to turn-off the tap to prevent the gas escaping. Defendant, who said he did not know what he was doing, was fined £4 for stealing the gas, and £1 for damaging the pipe.

Grays and Tilbury Gas Company.

The general meeting of the Company was held on Thursday, Feb. 21, when final dividends were declared at the rate of 9 p.ct. per annum on the "A" shares, and £6 6s. p.ct. per annum on the "B" shares (both less income-tax), for the year ended Dec. 31, 1923. The Chairman (Lt.-Col. F. E. Bartlett), in proposing the adoption of the report and balance-sheet, reviewed the accounts, which showed that the balance carried to profit and loss account for the year (after providing for depreciation and placing £1625 to the credit of the renewal fund) was £15 644, which, with the balance brought forward from last year, £3137, made a total of £18,782. After providing for interest on debentures and other charges, and the payment last September of interim dividends of £8 10s. p.ct. on the "A" and £5 19s. p.ct. on the "B" shares per annum (both less income-tax), amounting to £3733, there remained a balance of £7857 available for distribution. The dividends declared as above, together with the interim dividends paid in September last, made an average distribution for the year of £8 15s. p.ct. and £6 2s. 6d. p.ct. (less income-tax) on the "A" and "B" shares respectively, leaving a balance of £3903 to be carried forward. The Chairman congratulated the shareholders upon the results of the year's working, which, he was sure they would agree, were satisfactory; and he was pleased to be able to inform them that the Company were making good progress. The number of consumers upon the Company's books had increased during the year under review by 1006, and the sales of gas showed an increase of 59,958 therms, or about 15 million c.ft., as compared with 1922. Mr. C. C. S. Fooks (Deputy Chairman) seconded the motion, which was carried unanimously. Mr. P. G. Gales was unanimously re-elected a Director of the Company. On the proposition of Mr. H. W. Crow, seconded by Mr. J. T. Spooner, a vote of thanks was accorded to the Directors for their management of the Company's affairs. The Chairman suitably responded on behalf of the Board, following which Mr. W. Richards moved, and Mr. H. W. Crow seconded, a vote of thanks to the Engineer (Mr. A. W. Sumner), the Secretary (Mr. W. F. Whittaker), and the staff and workmen for their services. This was carried unanimously.

Dublin's Cheaper Gas.—The Alliance and Dublin Consumers' Gas Company announce a reduction of 2d. per therm, or 9d. per 1000 c.ft., in the price of gas, which, with other concessions during the past two years, makes a total reduction for that period of 2s. 7½d. per 1000 c.ft. —from 7s. 6d. to 4s. 10½d. The new price, which takes effect from the December meter readings—is 40 p.ct. above pre-war level.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Poulton-le-Fylde Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 14·4d. per therm.

DECLARATION OF CALORIFIC VALUE.

Burton-upon-Trent Corporation.—475 B.Th.U. (March 15.)
Market Rasen New Lighting Company, Ltd.—500 B.Th.U. (April 1.)
Newark Gas Company. — 475 B.Th.U., in substitution for 450 B.Th.U. (May 22.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Johnstone Corporation.

The Order is in the usual terms, but without any price being specified. (Feb. 23.)

BOURNEMOUTH GAS AND WATER COMPANY.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. William Cash, F.C.A. (the Chairman), presiding.

The Secretary (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting, and the minutes of the last annual meeting and extraordinary meeting; and the Directors' report and statement of accounts were taken as read.

Substantial Reduction in Gas Price.

The Chairman, in moving the adoption of the report and accounts, said he supposed the first thing a proprietor did on receiving the accounts of an undertaking in which he was interested was to look at the profits for the year. In the case of the Bournemouth Company it would be observed that the net profit for 1923 showed a considerable diminution when compared with that of a year ago. It might be within the recollection of the proprietors that at the annual meeting last February he pointed out that the carry-forward was considerable—that, in fact, it was nearly up to the statutory limit—so that the proprietors must not be surprised if the profits in the next year were smaller than on that occasion. Mainly, of course, the diminution was due to the alteration in the price of gas. They started the year 1922 with gas at 12d. per therm, reducing it on July 1 to 11·4d., and again on Oct. 1 to 10·4d. In 1923 they started the year with a price of 9d. per therm, and on April 1 reduced the figure to 8·6d. Therefore, if they took the all-over reduction in 1923 on the price charged in 1922, it meant that the price of gas had been reduced in the past year, as compared with 1922, by more than 26 p.ct. In a measure this had been compensated for by the largely increased sales. The total quantity of gas sold, apart from the additional amount used on the works for lighting and power, was 116 million c.ft. It was also gratifying to know that this increase operated under all heads—ordinary consumers, prepayment supplies, and public lighting. Putting all together, the increase in 1923 over 1922 amounted to 7·68 p.ct. The price of gas now was only 42 p.ct. above the pre-war charge, reckoned on the thermal basis, while evaluated per 1000 c.ft. the increase was even less than that. The increase in water charges over pre-war was only 25 p.ct.; and if they took any standard they cared to adopt for purposes of comparison—as, for example, the cost of living, which was 79 p.ct. above pre-war, or of wages, which were from 70 to 85 p.ct. up—it would be admitted that the increase in the Company's charges was of a very moderate order indeed.

Some Interesting Statistics.

During the past year the cost of coal and oil showed a considerable drop—equal to 3d. per 1000 c.ft. In the matter of residuals they had done well. Tar showed a very satisfactory increase, and the total residuals returned them 54·5 p.ct. of the cost of coal and oil. Looking at the actual consumption of gas per customer, they found that a very gratifying increase had taken place in the last ten years. In 1913 the average consumption per ordinary consumer was 62,028 c.ft., while last year the figure was 67,038 c.ft. The prepayment consumer figures showed a still more substantial increase over the ten years—namely, from 15,959 c.ft. to 28,849 c.ft. Proceeding to consider the districts, it would be remembered that in 1913 they took over the Christchurch Company, and supplied in that area Highcliffe, New Milton, and Milford-on-Sea. The first year after the acquisition the Bournemouth Company sold in that area 25 million c.ft., and last year they sold 78½ million c.ft. This growth had led to the Board agreeing to the building of a new holder at Christchurch, and the installation of additional pressure-raising plant there, to deal with this condition of affairs. Looking at the business as a whole, it was interesting to note that on Nov. 30 last they had a record day, and their output from Poole was very nearly 7½ million c.ft. For the week ended Dec. 1, the output was nearly 47½ million c.ft., as compared with 38 millions for the corresponding week of 1922—an increase of no less than 24·72 p.ct. All these figures would serve to give the proprietors an indication of the enormous growth of the business. He felt it was unnecessary for him to go in detail through the accounts, as the comparative figures for 1922 and 1923 were before them, and they could make for themselves such calculations as they might desire. In the gas revenue account, they had incurred heavy expenditure on repair and renewal of mains, due to the fact that, as the business grew, enlargements and alteration of pipes became absolutely essential. Under the heading of maintenance of stoves and fittings there was a considerable increase, owing to the continually increasing sale and hire of apparatus, which threw upon the Company the burden of keeping these appliances in an efficient state of repair.

The Water Undertaking.

It would be noted that the water rental showed some increase, but what the accounts did not disclose was the fact that they had supplied very much more water. That was to say, they were giving a more efficient supply, and, of course, their business grew. So far as the monetary aspect was concerned, in 1922 the increased charge was 33⅓ p.ct. for nine months, which was reduced at Michaelmas of that year to 25 p.ct. All through the past year the increase had been only 25 p.ct. They had completed the new 3 million gallon reservoir at Alderney, and new turbines at Langham, where they obtained power at a negligible cost when there was sufficient water in the river to work them. This had been the means of effecting considerable saving.

The Year's Results.

The results for the whole year were expressed in the dividends. In 1922, they paid in the first half-year on the original shares £7 12s. 6d. p.ct., and for the second half-year £8—a dividend for the whole year of £7 16s. 3d. In 1923, for both half-years, they proposed to pay £8 10s. Under the present standard which governed the Company's sliding-scale, they could, of course, distribute a larger dividend; but he thought the proprietors would approve of the policy of the Directors in reducing the price to the consumers and slightly increasing the dividend. It had to be borne in mind that, under the Gas Regulation Act, their standard price might call for revision at some future date. In the net revenue account there was no charge this year to make on the amount payable for income-tax by the Company. He told them on the last occasion that the Board were making special provision, owing to the fact that the assessment for 1923 would be based upon the profits for 1922. In the capital account they saw considerable expenditure both for gas and water purposes. The main expenditure, however, was for gas, in connection with the new buildings and mains. During the year, they had laid 17,000 yards of 4-in. mains, or 10 miles, for gas; and for water, 12,000 yards of 4-in. mains, or 7 miles. So they had been extremely busy in the distribution department. The trunk main from Bourne Valley had been converted to high pressure, and they had installed the necessary plant to furnish this pressure. The object was to supply a number of districts East of Bourne Valley to Southbourne satisfactorily, and the scheme had been successful. In 1923 there had been erected in the Company's district 1333 new houses, and among these they had secured 1168 new gas consumers and 480 for water. In connection with the distribution department they had endeavoured to avail themselves of the latest methods. A concrete breaker had been purchased for dealing with the work in the streets; and their officials had brought into use an invention of their own called a thrust boring machine for service laying. The object in both cases was to lessen labour and to expedite the repair of the roads. Last year they installed their own brass and iron foundry at Bourne Valley, and this they had found extremely valuable for dealing with urgent repairs. There had also been introduced another labour-saving appliance for mechanically feeding coke to the carburetted water-gas plant. Apart from these important matters, they had continued to receive throughout the year many minor suggestions for improvements from their men, which they encouraged. These included economical methods of working, methods of advertising, and safety devices in the works. He thought they were very fortunate in the Bournemouth Company in the way in which their staff and employees worked together. There were many organizations outside the immediate business of the Company which connected the staff and men together. There was a very good football club, which had been extremely successful; there were others for cricket, bowls, and tennis; there was a uniformed band, which was in great demand; and there were sports and a flower show. Last year the employees, through their hospital fund, contributed £320 (largely collected in small sums) to the local hospitals—a contribution which was very highly appreciated by the hospital authorities. Since he addressed the proprietors a year ago, the result of the therm inquiry had been announced; and it was some satisfaction to know that this system so much abused by the Press had been upheld as being a fair arrangement for charging for gas. The Board had decided to take new premises for showroom purposes in the heart of Bournemouth. Their showroom sales continued regularly to increase; and though they sold a very large quantity of apparatus from it, their present showroom was not large enough or important enough for a Company of their size. During 1923 their canvassing people took a census of the doctors. There were 154 medical men canvassed, and of these it was found that 146 were using gas, and had 442 gas-fires, while only 8 were without gas. All expressed appreciation of the benefits to be derived from the use of gas-apparatus. He mentioned this because there seemed sometimes to be some sort of idea that gas was not the most healthful illuminant or method of heating; and when they found the medical profession practically unanimous in Bournemouth, it should go a long way towards dispelling any lurking suspicion of this character which might find place in the minds of the public.

The Prospects.

During the year now entered upon they would have to meet some small advance in wages; and it was very gratifying to know that this matter had been settled without any friction or discord through the medium of the National Federation of Gas Employers and the Joint Industrial Council, which included the workpeople. So far as coal and oil were concerned, they had covered their requirements for a year ahead at slightly improved prices. With all this growth and expansion, the proprietors would not be surprised at the Directors asking them to authorize the issue of further capital. In connection with the Langham station, they had given an order

for new pumps to deal with 2 million gallons of water per diem. They were also laying new mains and putting-down plant which would give a better pressure of water on the East and West Cliffs. This pressure would be something more than their strict statutory requirements; but they wanted contented consumers, and he was sure the proprietors would think the Board were doing the right thing.

NEW GAS-WORKS.

So far as gas was concerned, they were now operating the Poole Works on the most favourable possible basis—that was to say, all the plant was fully occupied. It was, however, a matter of some slight anxiety as to what their position would be in the winter of 1924 if weather such as the present was experienced. It might mean that they would have to put Bourne Valley into operation again, which would prove very expensive. It had therefore been decided, as he foreshadowed a year ago, to proceed with the erection of a new gas-works at Pitwines, as authorized by Parliament in 1919. This step had been postponed as long as possible on account of cost, and even now it would be an expensive matter. This site would be connected with the works at Poole Quay by means of an overhead conveyor; and the Directors had acquired the land on which the works would stand and practically all the property necessary to carry out this connection. So far, all these purchases had been at agreed prices, and there had been no need to proceed to arbitration. The general lay-out had been finally determined, and railway sidings were already in. The main contracts had been let—including the vertical retort house, carburetted water-gas plant and relief holder, and coal and coke handling plant. It was hoped that the work would be completed for next winter, but strikes and weather conditions had caused certain delay. The works would include a new power house, and the latest labour-saving devices for coal and coke handling and the manufacture of gas. The whole of the works were being designed and carried out by their Engineer and General Manager, Mr. Moon, and placed a very heavy burden upon him. They had the helpful advice of the two engineering Directors, and it was highly gratifying to think that they had not had to go outside their own Board and their own officers in a matter such as this. He believed that, when the works were completed, they would be the last word in gas construction, and that they would be a works of which the Company could be justly proud. But the cost was going to be heavy, because they were contemplating an expenditure of something like £250,000 at Poole alone. During the year they had had visits from the Institution of Water-Works Engineers and the British Commercial Gas Association. The local authorities co-operated in welcoming them, and both organizations passed complimentary remarks upon the undertaking. He wished fully to acknowledge how well the Company were served by the General Manager and the officers and staff. They had a contented body of employees generally. They were endeavouring to foster this feeling by means of their co-partnership and pension schemes, and so forth; and he saw no reason why the Company should not continue in the future the career which had been so prosperous in the past.

Sir CHARLES L. MORGAN, C.B.E. (the Deputy-Chairman), formally seconded the motion, which was carried unanimously.

THE DIVIDEND AND RE-ELECTIONS.

On the proposition of the CHAIRMAN, seconded by Sir CHARLES J. JESSEL, Bart., it was resolved that the interim dividends to June 30 at the rates per annum of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and 8½ p.ct. on the original shares, be confirmed; and that dividends for the second half-year be declared at the rates per annum of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and 8½ p.ct. on the original shares.

The CHAIRMAN proposed the re-election of Sir Charles L. Morgan as a Director; remarking that he was also on the Board of other important undertakings, including the Southern Railway, who served the Company's district. At the present moment Sir Charles Morgan was President of the Institution of Civil Engineers. His experience of engineering matters was very wide, and he was of the greatest assistance to the Company.

Mr. E. HONORATUS LLOYD, K.C., seconded the motion, which was agreed to, and acknowledged by Sir CHARLES MORGAN.

The CHAIRMAN next proposed the re-election as a Director of Sir Charles J. Jessel, Bart., who he said was equally valuable to them. He had had a great many years' experience of gas administration, as Chairman of the Imperial Continental Gas Association and in connection with other undertakings.

Lieut.-Col. HAROLD W. WOODALL, C.I.E., seconded the resolution, which was carried, and Sir CHARLES JESSEL replied.

On the motion of Mr. PILLEY, seconded by Dr. RODMAN, the retiring Auditor (Mr. Lewis Hardy, F.C.A.) was re-appointed.

SERVICES ACKNOWLEDGED.

The CHAIRMAN proposed a hearty vote of thanks to the executive officers, staff, and workpeople. He said the Board earnestly felt that they were very well served by the General Manager, by those immediately under him, and by the workpeople generally. He had told them of the amount of work on Mr. Moon's hands at the present moment. He was managing a gas undertaking and a water undertaking, and, in addition, had the control of all the constructional work. One of the things Mr. Moon did as well as anything was to keep the Company on most excellent terms with the local authorities with whom they had to deal. This was a tradition which had been fostered by Col. Woodall when he was General Manager; and the same remarks would apply with equal force to the Company's relations with their consumers. As regarded the actual working, the accounts showed how good this was. The make of gas, costs, and so forth, compared favourably with those of any like undertaking. He could also say a lot about the excellent work of the London staff.

Mr. ROBERT H. GLEN seconded the vote, which was heartily accorded.

Mr. P. G. G. MOON, on behalf of those who serve the Company at Bournemouth, acknowledged the appreciative remarks that had been made. He said that on other occasions he had claimed they were a very happy family at Bournemouth, and to this fact, to a large extent, was due whatever efficiency in working they might achieve there. It was a great pleasure to be able to re-affirm this now, when the industrial world generally was so full of unrest. They were still a happy family, and it was owing largely to the spirit of understanding which existed between those who worked for the Company and those who happened for the time being to be in charge of them. So far as the work at Bournemouth was concerned, he had the very greatest help, not only from his immediate assistants, but from every employee of the Company. They were all proud to belong to so progressive an undertaking, and one which looked so well after their interests. The Company secured the benefit of the loyal co-operation which came from this good understanding and this satisfied feeling. In the past year they had greatly needed this loyal co-operation, because they had had a very busy time indeed. It was certainly stimulating in these days to belong to the gas industry, which was one of the great public services of the country.

An Extraordinary Meeting.

An Extraordinary General Meeting of the Company was then held, at which the following resolutions were submitted—

1.—Rescinding the resolution passed by the proprietors at an extraordinary general meeting of the Company held on Friday the 16th of February, 1923, authorizing the Directors to raise additional capital by the creation and issue of "original" and ordinary ("B") and /or preference shares so far as any share capital shall remain to be issued under the authority of such resolution to date.

2.—Authorizing the Directors to raise additional capital (*a*) in accordance with the provisions of the Bournemouth Gas and Water Act, 1919, by the creation and issue of 10,000 "original" shares of £10 each (carrying a standard rate of dividend of 5 p.ct. per annum) and (*b*) in accordance with the provisions of the Bournemouth Gas and Water Act, 1913, by the creation and issue of 10,000 ordinary ("B") and/or preference shares of £10 each limited as to the ordinary ("B") shares as to dividend in any one year to the sum of seven pounds and as to the preference shares to six pounds respectively for every one hundred pounds actually paid up on such shares exclusive of any sum paid by way of premium.

3.—Authorizing the Directors to exercise the borrowing powers of the Company, as extended by the Bournemouth Gas and Water Company (Capital Issues) Consent, 1921, by the creation and issue of £66,667 stock to be called irredeemable or redeemable debenture stock.

The CHAIRMAN briefly explained the proposals, and moved the adoption of the resolutions, which were seconded by Mr. HONORATUS LLOYD, and passed by the meeting.

The proceedings were brought to a close with a vote of thanks to the Chairman and Directors, which was moved by Mr. GLEN.

DERBY GAS LIGHT AND COKE COMPANY.

The Annual Meeting of the Company was held last week at the offices, when a further reduction in the price of gas was announced.

The CHAIRMAN (Mr. William Woolley) proposed the adoption of the report, which recommended a dividend of 4½ p.ct. (less income-tax) for the half-year, making 7½ p.ct. (less income-tax) for the year. He remarked that results for the past year were highly satisfactory, especially when they considered that trade depression and unemployment, though not so acute as in 1922, still continued. The results, however, indicated steady and continuous progress. During the year under review the sales of gas showed an increase of 6½ p.ct., and in all departments there had been good progress. Consumers had increased by 421, and the meters in use now numbered 38,230, while there were some 226 miles of mains—an increase of about 5½ miles. In addition, considerable renewals had been carried out, and small mains had been replaced by larger ones. A new power department had been added to the works, so that those using gas for power purposes could have their gas-engines periodically examined and their condition reported on. In order to do their part to lessen unemployment, the Directors had decided to carry out extensions and renewals of plant at the Litchurch, Cavendish Street, and Belper Works, and also to extend and replace certain small mains by bigger ones. The Directors had already arranged for the erection of some houses to be let to their employees at moderate rents. The great difficulty, Mr. Woolley said, was to provide suitable houses that could be let at a rent within the means of the average worker, and at the same time give a reasonable return on the money invested. The dividend recommended, observed the Chairman, showed an increase of 1 p.ct. as compared with the previous year. From the sales of gas the receipts for the year were £225,455—a decrease of £19,337 upon 1922, due entirely to the reduction in price of 5d. per 1000 c.ft. made in March last. The total revenue for the year was £370,538, or £4799 more than in 1922; and the balance carried to profit and loss account was £77,400, as against £54,872 in 1922—an increase of £22,528, due to £17,729 decrease in expenditure and £4799 increase in revenue. The Directors had decided to make a further reduction in the price of gas of ½d. per therm, or 2½d. per 1000 c.ft., to date from Jan. 1. Prepayment consumers would receive a rebate of 5 p.ct. on all money collected commencing from March 1. This reduction in the price of gas would cost the Company over £15,000 per annum.

Alderman W. HART seconded. He said it was gratifying to be able to put such good results before the shareholders.

Mr. HARRY CLARK referred to the purchase of additional land at Litchurch and Belper, and said it showed the diplomacy of the Board in looking ahead and providing for the future requirements of the Company. The gas supplied was of high quality—in fact it might be said they were supplying gas with "overweight." They knew, however, that they were giving the consumers complete satisfaction.

The report was adopted.

Replying to a vote of thanks to the staff, Councillor J. FERGUSON BELL (General Manager and Engineer) said it was a pleasure to be associated with such a loyal body of workmen. There never was a time when the prospects of the industry were brighter than to-day, and the Derby Gas Light and Coke Company stood in the front rank.

LEA BRIDGE DISTRICT GAS COMPANY.

The Annual General Meeting of the Company was held at the Offices, Nos. 63 and 64, Chancery Lane, W.C., on Tuesday of last week—Mr. A. M. Paddon presiding.

The Secretary (Mr. Henry Hand) read the notice convening the meeting, and the report of the Directors and the statement of accounts were taken as read.

Steady Increase in Business.

The Chairman, in moving the adoption of the report and accounts, said, referring in the first place to the report, that it would be seen that the sale of gas during 1923 showed an increase of 8·33 p.ct. over that of the previous year. This was equivalent to 61 million c.ft. The characteristic feature of the Company's progress was the steady order of the increases, which did not vary spasmodically. If there was an acute fall of temperature, they were not troubled with the sensational increments of consumption which occurred in some districts; while, on the other hand, if the temperature rose, a loss of output was not experienced. The fact was that their consumers were regulated in their use of gas by what they could afford, rather than by what they desired to burn.

Gas best for Public Lighting.

There was a point in connection with this increased consumption which should be noted. During the past year (which was the period under review) gas for the purpose of public lighting had in their case been entirely eliminated. There was no longer any gas used for public lighting in either of the parishes constituting the Company's area of supply. This was rather remarkable, because gas as an illuminant had not disappeared from the City of London, Regent Street, Whitehall, or any of those places where it was a *sine quâ non* that the most effective form of public lighting should be installed. A little while ago he was in Paris, and found that the city was lighted almost throughout by gas. It was perfectly well known that, for the lighting of big spaces, there was nothing comparable with gas for illumination combined with economy. It was therefore somewhat remarkable that there should be no gas for public lighting in the areas where, when the duty was confided to the Gas Company, it was extremely well performed. He was informed that the substitution of electric for gas standards had been carried out by the enlistment of the unemployed. It seemed rather fatuous to replace an economical with a less economical method of lighting, and to incur the expense of doing so, for what he might call the detriment of the district generally.

Price Reductions.

During 1923, the report told them, the price of gas had been reduced from 11d. to 10d. per therm, and as from Jan. 1 last it had been further lowered to 9½d. per therm. This meant that, in something like 21 months, from Lady Day, 1922, to Jan. 1 last, there had been an aggregate reduction of 3½d. per therm in the price of gas; and this was equal in one year to a reduction in the expenditure by the gas-consuming public of £52,000. That was to say, if the consumers were taking the same amount of gas as they did two years ago, the cost in one year now would be £52,000 less than it was in the earlier period. The dividends were maintained at their former figure; and, while £1823 was carried to the reserve fund, there was an augmented carry-forward of £17,041. In the capital account, the amount they had received appeared as £392,460, which was equivalent to £494 per million c.ft. of gas—an obviously favourable figure when the size of the undertaking was considered. But a qualification was necessary here to arrive at a correct impression, because of this total a certain amount was added on conversion, as a book entry; and if this were deducted so as to bring the capital into accurate relation with the sum that had been at the Company's disposal, this would bring the capital down to £456 per million c.ft. of gas, which was very satisfactory. During the past year there had been debited to capital £60,148—a very large sum for them.

Storage Capacity Increased.

One item alone of this capital expenditure represented £50,159, and was explained by the fact that a new gasholder had been provided, which had not only made good their deficiency in the matter of storage, but had given them an ample margin for many years to come. As he had said, this was a very big sum for a Company like theirs to incur, and yet to succeed in keeping the capital down to the very low figure he had mentioned. This, of course, could not have been done unless a very considerable amount of skill had been exercised in the expenditure of the money. The holder was badly wanted five years ago; but Mr. Cross had struggled along without it, because he knew that every day he could delay the putting in hand of the work would decrease the cost. As a matter of fact, the storage capacity had got as low as eight hours' supply, whereas they had now, he believed, got nearly twenty-four hours' storage. A sum of over £12,000 had been written-off for depreciation. In the revenue account, by the sale of gas they had lost nearly £13,000, wholly due to the reductions in the price of gas. A little of this had been picked up in rental of meters, stoves, and fittings, which indicated a general expansion of business. In this way, the deficit had been reduced to £11,427. Residuals had come to their assistance by yielding £5535 more; so that the total deficit, notwithstanding the tremendous decrease in the charge for gas, came only to £5892. On the debit side of the account this was almost wiped out at once by a reduction of £5800 in the cost of materials for the manufacture of gas. Mains, services, meters, and fittings were responsible for some increases, which could only be effected with such a growth in business as the undertaking was experiencing. Carbonizing wages came out at 2·9d. per 1000 c.ft. This closely approximated to the figure which obtained before the war, when materials and labour were at less than one-half the rate at which they now stood. This showed what had been accomplished meanwhile, by the adoption of labour-saving devices and economies on the works. Next came those items constituting the maintenance of the undertaking, and they amounted to just over 1s. 7d. per 1000 c.ft. The works were in a thoroughly efficient condition, as they had been for a long time past.

Co-partnership.

A sum of £1583 had been taken to the benefit fund, £2350 to the special purposes fund, and £2303 to the co-partnership fund. The last-named sum was temporarily on deposit with the Company, who were paying the co-partners interest upon it, until the necessary stock could be procured. This was the first occasion he had had of referring to co-partnership as a feature of their Company's business. While the Board anticipated a good deal from it, he did not think they would be disappointed in any way. The principle of co-partnership, as they all knew, addressed itself to something far more than the difficulties of the undertaking. It was an honest, practical, and effective contribution to the settlement of labour difficulties generally. At the same time, he would venture to warn those contemplating its adoption that they must not regard it as a thing which could be introduced perfunctorily, and would then look after itself. Anyone who so regarded it would be vastly mistaken. It required assiduous care and attention on the part of the officers and the Board responsible for its introduction; and without this constant supervision and constant attention, one had better not have it at all. But if it was encouraged and fostered, the results were very remarkable indeed. The Company would feel that they had not only contributed to the comfort, self-respect, and peace of mind of all their old employees, but that they had set other people an example which, if only they would follow it, would have results that would surprise them.

The Financial Result.

The balance of net profit for the year was less by £2225, but, as the statement showed, was ample for all requirements, even after the very heavy appropriations to which he had referred. In the profit and loss account, they would see that £16,872 had been brought in, and £17,041 taken out, which showed that they had increased the carry-forward by £169. On the present occasion the form of account had been somewhat altered, to conform with the general practice. Looking at the final balance-sheet, on the credit side the capital account was debited with £46,000. In other words, they had spent £46,000 more for capital purposes than they had received, so that they must have drawn upon the revenue account temporarily for this amount. But after what he had told them about all the Company had done in the way of reducing the price of gas, he did not think the consumer had anything to complain of. In fact, the consumer got the full use of this £46,000, without having to find any interest on it at all. The future of their undertaking he regarded as rather more stable than was the case with gas companies in more opulent districts. There were many points in favour of gas, one of the strongest of which was its adaptability for cooking. For this purpose it possessed overwhelming advantages as compared with electricity. In connection with heating, gas possessed another very fine field of activity; but here he thought it was for use in bedrooms that gas would develop most rapidly. The amount of ill-health that had been staved off already by the occasional use of gas-fires in bedrooms was something which only medical men could compute, but they set a very high figure indeed upon it. A district such as theirs did not afford very great scope for electricity, and he thought that for some time to come they might confidently look forward to steadily maintained increases in gas consumption, which would ensure the prosperity of the undertaking.

The Deputy-Chairman (Mr. G. W. Carey) seconded the resolution, which was unanimously carried without discussion.

Dividend, Directors' Fees, and Re-Elections.

On the proposition of the Chairman, seconded by Mr. J. M. Miles, dividends were declared at the rates of 5 p.ct. per annum on the preference stock and 6½ p.ct. per annum on the consolidated ordinary stock, both less income-tax. It was also resolved to carry £1823 to the reserve fund.

The Chairman said the Board were going to ask the proprietors to vote them an increase in their remuneration, the effect of which, on the finances of the undertaking, would, of course, be infinitesimal. It would, however, make a certain difference to the Directors and to the standing of the Board; and the Board which administered the undertaking in the future would have an enhanced and steadily growing responsibility. Since this matter was last considered, the business had increased 33 p.ct., and there had been an almost complete re-organization of the Company in every way. The position of the undertaking in its physical features to-day was better than it had ever been in the past. Therefore the Board felt they could with propriety ask that their fees should be increased by £300 per annum.

Mr. Beck seconded the proposition, which was readily agreed to.

Moved by the Chairman, and seconded by Mr. A. F. Phillips, the retiring Director (Mr. J. M. Miles) was re-elected; and the retiring Auditor (Mr. E. L. Burton) was re-appointed on the proposition of Mr. W. B. Farquhar, seconded by Mr. R. E. Gisburne.

The Chairman proposed a hearty vote of thanks to the officers of the Company and their respective staffs for their services during the past year. The vote had special significance on this occasion, because the Board had recently received the resignation of Mr. Richard Sandell as Secretary of the Company. He could not tell them how sorry they were to hear that Mr. Sandell could no longer carry on his duties. He had been with the Company for 56 years, and for 42 years had acted as Secretary. It would be impossible for any undertaking to have had a more devoted or more efficient servant than Mr. Sandell. During all these years he had shown an almost affectionate interest in everything that appertained to the Company's welfare. As to their esteemed Engineer and General Manager, all he had said about Mr. Sandell applied equally to Mr. Cross, with the exception of the length of service. Mr. Cross had been with them nearly 30 years, and from first to last he had performed his duties with the greatest skill and efficiency. It was impossible to believe that any executive officer enjoyed the esteem and confidence of his colleagues to a greater extent than did Mr. Cross.

Mr. G. W. Carey, in seconding, said that he had had a good deal to do with Mr. Sandell in connection with commercial matters, and he felt he had lost a personal friend.

The resolution was cordially passed.

Mr. F. W. CROSS, in acknowledgment, expressed his extreme regret at the loss of Mr. Sandell as a colleague. He trusted Mr. Sandell would have better health than had lately been the case, so as to be able to enjoy his retirement.

The proceedings terminated with a vote of thanks to the Chairman and Directors, which was proposed by Mr. FARQUHAR and seconded by Mr. BECK.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of the Company was held last Monday at the London Offices, No. 139, Cannon Street—Mr. ARTHUR F. PHILLIPS in the chair.

The SECRETARY (Mr. E. D. Davey, A.C.A.) read the notice convening the meeting; and the Directors' report and the accounts for the six months ended Dec. 31 were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the results of both the gas and water undertakings were highly satisfactory. The consumption of gas showed an increase of 9 p.ct. on the corresponding previous half-year. There had been no further reduction in the price of gas, which remained at 11d. per therm—a reasonable price for such a works as Barnet. The Directors, however, looked forward to a further reduction. There had been no expenditure on capital on the gas accounts. The gas rental for the half-year was £29,819, against £31,954 for the corresponding previous half-year. Coal had cost £17,295, against £16,322; and the balance of profit was £9355, against £8782 for the previous six months. The water rates had realized £35,520. Repairs of works amounted to £4277, and the pumping charges £7016. All the other charges remained much the same. The profit on the water undertaking was £14,077, compared with £13,476. There was an expenditure for mains and services of £1643 charged to water capital, and £3653 for the Roestock pumping station charged to the contingency fund. The balance standing to the credit of profit and loss was £38,016. After paying the statutory dividends of 10 p.ct. on the "A," "B," and "C" stocks, and 7 p.ct. on the "D" capital, there would remain £25,189 to carry forward. The business during the past half-year had been carried on without difficulty. The coal supplies had been ample, and the quality good. The whole plant of both the gas and water works had been maintained in an efficient state. The new pumping station at Roestock had proved of great service in helping to meet the ever-increasing demand for water. They were now seeking to test the water supply from a well sunk by the Company some years ago at Northaw. Works were also being carried out at Tyttenhanger, to obtain an increased supply of water from that station. As the water district of the Company continued to develop, and the consumption of water to increase, it was necessary to find additional supplies. He regretted to inform them that they would lose the services of Mr. F. J. Bancroft, who had been the Company's Engineer and Manager for sixteen years, and under whose direction the business had done so well. Mr. Bancroft had previously been with the Company for ten years as Assistant Engineer. They were very sorry to lose him; but as he wished to retire, they had no alternative. They had appointed in his place a capable gentleman, Mr. Haseldine, who they trusted would prove equally satisfactory.

The DEPUTY-CHAIRMAN (Dr. J. W. L. Glaisher, F.R.S.) seconded the motion.

The resolution was then put to the meeting and carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. COLIN DOCWRA, dividends for the half-year were declared at the rate of 10 p.ct. per annum on the "A," "B," and "C" stocks, and 7 p.ct. per annum on the "D" capital gas and water stocks.

The retiring Directors (Mr. A. F. Phillips and Mr. Alfred Wood) were re-elected on the proposition of the DEPUTY-CHAIRMAN, who referred to the benefit which the Company derived from the knowledge of gas manufacture possessed by Mr. Phillips. Mr. Wood was concerned with other gas companies; and the value of his wide experience was very great.

Mr. J. M. WOOD proposed the re-election of the retiring Auditor (Mr. B. Dennet Holroyd); the motion being seconded by Mr. PEARCE, and being unanimously agreed to.

Mr. PEARCE then moved that the Auditors' fee be increased to 150 guineas. This was seconded by Mr. BALE, and met with the approval of all present.

The CHAIRMAN said that their best thanks should be accorded to the staff for their work during the year. Mr. Davey had a most efficient control of the affairs of the Company. To the excellent work of Mr. Bancroft, whose past services all fully appreciated, the development of their business was largely due; and the results put forward that day were in no small measure due to his energies throughout his long career with the Company.

Mr. C. P. CROOKENDEN seconded the vote of thanks.

Mr. DAVEY, in replying to this appreciation, said that for many years Mr. Bancroft and himself had worked in complete harmony, and his retirement was a great loss to the Company.

Mr. BANCROFT said he would take the opportunity of thanking the Directors for the confidence they had placed in him; and in this respect he mentioned in particular their Chairman, who had given and was still giving such attention to the welfare of the business, and who had always helped when difficulties had arisen. Throughout the war the Company had paid pre-war dividends, and he was glad to say that at this meeting—the last he would attend in his official capacity as Engineer and Manager—the maximum dividends had been declared. He had worked in conjunction with a loyal staff; and thanks were especially due to Mr. Davey. In his successor, Mr. Haseldine, the Company had secured the services of a man of ability and personality.

A vote of thanks to the Chairman concluded the meeting.

The price of gas at Darwen is being reduced from 4s. to 3s. 8d. per 1000 c.ft.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

Proposed Acquisition of the Walker and Wallsend and Chester-le-Street Gas Undertakings.

Mr. JOHN E. COWEN, Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, presided at the annual meeting of shareholders in Newcastle on Feb. 26, and in moving the adoption of the Directors' report, he outlined a scheme for establishing a proposed pension and widows' and orphans' fund.

He said that, as far back as 1897, the late Sir William Stephenson recommended that a superannuation scheme should be started, and at present in some cases small allowances were given to old employees; but these were only from year to year, and were not satisfactory, and probably not always fair. The Directors had come to the conclusion that if any scheme was adopted it should apply, not only to the officials and clerical staff, but also to the wages employees. A scheme had been prepared, with the assistance of actuaries, on new, but they believed sound, lines. It was a voluntary and mutually contributory scheme. The Company's contributions to meet their liability under the scheme for back service would be spread over a number of years, and the amount which the Company contributed in respect of current service depended upon the annual rate of dividend paid upon the ordinary stock, with a guaranteed minimum of 3 p.ct. Therefore the larger the dividend the greater the amount which would be paid into the pension fund, and consequently the larger would be the pensions. This put the scheme on a profit-sharing basis. Another important feature was that, in the event of a married employee dying and leaving a widow or child or children under sixteen years of age, these dependants would receive substantial death benefits, varying with the length of service of the deceased with the Company. This portion of the scheme was very much appreciated by the employees, and was a feature which in most pension schemes was inadequately dealt with. There would be a Management Committee, on which the employees would be represented. Forms had been signed by those wishing to join the fund, authorizing the Company to make the necessary deductions from their pay, and there had been a splendid response. The Directors strongly recommended the scheme. As they had had a good year, mostly due to the large return from residuals, they suggested that £20,000 be put to a suspense account from which they could draw some of the future contributions required to be paid by the Company to the trustees of the pension fund. The report was adopted, and the scheme for the establishment of the fund confirmed. The report stated that the sale of gas during 1923 showed an increase of 6·58 p.ct. over the previous year. The price of gas had been reduced in the period under review from 10d. to 8·8d. per therm, and a further reduction of 0·2d. per therm was proposed to be made as from the meter readings in December last.

An extraordinary meeting of the shareholders followed, at which resolutions were submitted respecting a proposed application to the Board of Trade for a Special Order to acquire the undertakings of the Walker and Wallsend Union Gas Company and the Chester-le-Street Gas Company. The Chairman explained that the Walker and Wallsend Gas Company's Act of 1866 and the Newcastle Company's Act of 1867 contained powers for the former Company to lease or sell, and for the latter Company to take a lease of, or purchase, the Walker Company's undertaking. There had been various attempts in past years to bring about an amalgamation of the two Companies, but without success. Terms had, however, now been arranged, and the Walker and Wallsend and the Chester-le-Street Companies had issued circulars to their shareholders giving a summary of them. The necessary resolutions were adopted.

WALKER AND WALLSEND UNION GAS COMPANY.

Transfer to the Newcastle and Gateshead Company.

The Annual Meeting of the Company was held at the Offices, Neptune Road, Wallsend, on the 26th ult. Mr. A. LAING (Deputy Chairman) presided; and at his motion a resolution of sympathy was passed with the Chairman (Mr. C. J. Potter) in his severe illness, and one of regret and condolence at the death of Alderman R. I. Dees, who had been a Director since 1909.

The CHAIRMAN congratulated the shareholders upon a favourable result for the year, notwithstanding the trade depression experienced in the district. The output of gas had increased by 4·84 p.ct. The receipts from gas sales, however, showed a decrease of £9436. This was owing to the reduction in the price of gas to 10d. per therm, which price had operated during the whole of the year. The gross profit for the year was £20,292, which, added to the balance of undivided profit of £13,581 from the previous year, gave an amount of £33,874 for appropriation. From this, after providing for interests, the Directors recommended the payment of final dividends at the same rates as last year, the placing of £1881 to the credit of the reserve fund (bringing it up to £7650), and the transfer of £1600 to the insurance fund—which was greatly depleted owing to the coal strike in 1921—making it up to £4872, leaving a balance to carry forward of £13,657. Despite a reduction of 1330 tons of coal carbonized, the gas sales in therms increased by 4·84 p.ct. The coke saleable per ton of coal carbonized increased by 3·37 p.ct. Since last year, an Amending Order had been made by the Board of Trade, whereby the standard price of gas had been reduced from 14·8d. to 11·8d. per therm. The Directors had thought fit to reduce the price of gas from 10d. to 9·4d. per therm from the December meter readings, and under the new Order this price would carry dividends of 5 p.ct. per annum on the 3½ p.ct. consolidated stock and 6½ p.ct. per annum on the 5 p.ct. ordinary stock.

The report and accounts were adopted, and final dividends were declared upon the preference stock at the rate of 2½ p.ct., making 5 p.ct.

for the year; upon the 3½ p.ct. consolidated stock at the rate of £3½ p.ct., making 5¼ p.ct. for the year; and upon the 5 p.ct. ordinary stock at the rate of 4¼ p.ct., making 6⅜ p.ct. for the year—all less income-tax.

An Extraordinary Meeting followed on the question of amalgamating with the Newcastle and Gateshead Company.

The CHAIRMAN said that the possibility of the Company amalgamating with the Newcastle and Gateshead Gas Company was not a new proposition. It had often been mooted in the past—in fact, as far back as 1866, when the Company obtained their first statutory powers upon the union of the Walker and the Willington Companies, provisions were included in that Act authorizing the undertaking being transferred to the Newcastle Company. The areas of the two Companies joined one another—the parish of Walker, which was supplied by the Company, being part of the City of Newcastle, which, with the exception of the Walker area, was supplied by the Newcastle Gas Company. For many reasons an amalgamation between the Companies now appeared opportune. The capital of the Newcastle Company was about ten times larger than that of their own Company. It was one of the largest provincial companies in the kingdom. This tended to a better security. Economies would be effected in the future, because small companies had, of course, not equal facilities and advantages when compared with larger ones. In the near future, their Company would have to increase the storage capacity, involving a large capital expenditure, interest on which would have to be provided out of profits. To be brief, taking matters generally, the Directors thought it advisable to enter into this amalgamation in the interests of the shareholders.

Dr. H. H. AITCHISON said that, from sentimental reasons, he was sorry the Company were coming to an end. After such a successful report, it appeared strange to him that they were asked to be "snuffed out" by the Newcastle Company. He did not think they were going to get very great results from it, or that they were coming out of the bargain any too well.

The CHAIRMAN replied that the Directors had considered the situation very thoroughly, both in regard to the present and the future, and were unanimous that the amalgamation would be well for the shareholders. He thought they had done very well in regard to terms.

The proposal to amalgamate was carried with one dissentient.

SOUTH SHIELDS GAS COMPANY.

Centenary of the Undertaking.

Reference was made by Sir James Readhead at the annual meeting of the South Shields Gas Company on the 26th ult. to the fact that this year marks the centenary of the undertaking. The Company was formed by Deed of Covenant on March 17, 1824, with an original capital of £4000, divided into shares of £25 each. Gas was first supplied to houses and shops in the town on Oct. 1, 1824. Mr. John Lister was the first Secretary, and Mr. Sanderson the first Engineer. A little later a smaller company was formed in opposition. What its object was he did not know, but it was soon merged into the Company they knew to-day. From the records, it was found that 37 years ago the Company had 6365 consumers, while to-day they had 36,000. The capital employed at present was £431,733, and nearly 60,000 tons of coal per annum were required for gas manufacture.

Dealing with the report and accounts, the Chairman called attention to a slight decrease of 1·44 p.ct. in the sale of gas, which, he said, was entirely due to a decrease in consumption by prepayment meter users. It was, however, a very small reduction. With respect to the revenue account, it was gratifying to have to report a decrease in expenditure of £4109. Unfortunately, a considerable increase in the price of coal had taken place during the year, involving additional expenditure to the extent of approximately £10,500. This item alone was equivalent to an increase of 4d. on 1000 c.ft. of gas sold. In co-operation with the officials and staff, it had been decided to inaugurate a joint superannuation fund, which had now been in operation for a full year. The profit on the year's operations amounted to £20,211, or £524 more than was required to meet pre-war rates of dividend and interest on mortgage loans. Having regard to all the circumstances, he thought they would agree with him that the financial results had turned out highly satisfactory. He expressed the thanks of the Directors for the good service of the officials and employees and the loyalty and co-operation of the latter in carrying out wages agreements. They had had no trouble whatever in this respect. It was fortunate and pleasing that a basis had been arrived at, and that this basis had been so loyally adhered to.

The report and accounts were adopted, and dividends were declared of 8½ p.ct. per annum on the consolidated and new stocks, and 5¾ p.ct. per annum on the ordinary stock—both less income-tax.

Eastbourne Gas Company.—It was stated at the meeting of shareholders that the revenue account for the six months ended Dec. 31 showed a profit of £10,039; and dividends were declared for the half-year at the rates per annum of 8½ p.ct. upon the "A" stock, 6⅜ p.ct. upon the "B" stock, and 5 p.ct. upon the preference stock. There was a sum of £26,469 at credit of profit and loss account, and the payment of these dividends would leave a balance of £17,018 to be carried forward. The Chairman (Mr. Caleb Diplock) pointed out that in future the dividends would be based on the quarterly price of gas. There would be an annual dividend, with an interim distribution; and there would be only one meeting a year. The price of gas was reduced from October last from 11·6d. to 10d. per therm. At the same time the declared calorific value was increased to 500 B.Th.U.—a step which it was felt had been appreciated by the consumers. The report and accounts were adopted, and the Directors were authorized to issue, as required, new capital up to the amount of £50,000. A vote of thanks was replied to by Mr. William H. Hammond (Resident Engineer and Works Manager) and Mr. James S. Garrard (Secretary).

BATH GAS LIGHT AND COKE COMPANY.

Gas at Fivepence a Therm.

At the Annual Meeting of the Company, held on Feb. 19, Sir PERCY K. STOTHERT, K.B.E., J.P. (Chairman of the Directors), called attention to the fact that a further reduction in the price of gas had been made during the year, from 5½d. to 5d. per therm (equivalent to 2s. per 1000 c.ft.). This was within 2d. of the lowest price ever reached by the Company in pre-war days.

It had been stated, said the CHAIRMAN, that the gas industry was a decaying one. What were the facts with regard to their Company? In the year under review the make of gas was 1065 million c.ft.—yet another record. During the past year, the Company had made an offer to light the city by gas; but this had been refused. It was difficult to understand why electricity should be preferred. If a large and progressive city like Birmingham, which owned both electricity and gas undertakings, and cities like London and Liverpool, where gas concerns were privately owned, came to the conclusion that gas was the best illuminant for the central portion of these cities, it seemed only just that their offer should have received careful and full investigation, instead of being summarily rejected. Turning to the accounts, they would notice that the amount received from the sale of gas came to £109,118, against £130,970 for the previous year. This was due to the lower price of gas. He might mention that, during the year, 411 new consumers had been placed on their books, while at the showrooms 1020 fires, 380 cookers, 258 geysers, &c., had been sold. The balance-sheet showed a profit of £18,644, in comparison with £17,381 for the previous year. Before closing his remarks, the Chairman paid tribute to the excellent work of their Engineer and Manager (Mr. J. Wesley Whimster) and their Secretary (Mr. Blundell) during the year.

The DEPUTY CHAIRMAN (Mr. E. W. Rooke) seconded the proposition; and the report and accounts were passed unanimously.

It was unanimously decided to declare the maximum dividend of 5 p.ct., less income-tax, for the half-year ended Dec. 31 last.

CHELTENHAM GAS LIGHT AND COKE COMPANY.

The Annual Meeting of the Company, which was held on Saturday last, was presided over by Mr. J. P. WINTERBOTHAM, who, in opening the proceedings, expressed regret at the death of the late Chairman, Mr. Rowland Ticehurst.

The CHAIRMAN, moving the adoption of the report and accounts, said there was a profit for the year on revenue account of £1786, and a dividend on the consolidated ordinary stock was recommended at the rate of 5 p.ct. per annum, for the half-year ended June 30, 1923, partly out of the profits of the past year, and partly out of the reserve fund. It was also recommended that discretionary power be given the Board to pay a further dividend during the ensuing year for the half-year ended Dec. 31 last, with recourse to the reserve fund if necessary. There had been an increase of over 8 million c.ft in the quantity of gas sold. Owing, however, to reductions in price made during the year, the receipts from this source had fallen by about £5500. The Directors had considered it advisable to place as much as possible of the cost of replacement of old works to this year's revenue account, so as to relieve the position in future years, which would enable the Company better to resume dividends without raising the price of gas.

Mr. BULLOCK, in seconding the motion, referred to the prosperity enjoyed by the Gloucester Gas Company, and said he saw no reason why the Cheltenham Gas Company should not attain to a similar position.

Mr. JAMES PATERSON expressed for himself and a number of other proprietors their grave concern at the accounts presented. After a year of successful trading, in which the price of gas was reduced, they showed a gross profit of only £1786. This minute balance was due to the amount charged for renewal of retorts—namely, £33,300. If a portion of that only had been placed to works maintenance suspense account, to be gradually worked-off in the coming years from the balance of the revenue account, the Directors would have been enabled to pay a dividend. The Company's Manager, in a written communication to the Board, had recommended that the sum of £19,700 in respect of renewals be charged to revenue, thus leaving a gross profit from revenue of more than £15,000—an amount sufficient to pay the interest on the debenture stock and the dividend for the whole year. Unfortunately the Directors did not accept it. The effect of this extraordinary administration was that the Directors asked authority to make up the dividend by realization of the reserve fund. It appeared to him in the highest sense injudicious to realize the balance of a fund which in the past had proved extremely useful, and the absence of which in the future might prove a terrible handicap to the Company. He moved as an amendment: "That the Directors be and are hereby instructed to write back from the repairs and maintenance of works and plant the sum of £13,600 to the works maintenance suspense account, thereby increasing the balance on the revenue account to £15,386."

Mr. W. S. MORLAND seconded, remarking that it would have been advisable to distribute this large sum for repairs over a number of years.

The CHAIRMAN replied that the matter had been very fully considered by the Board before deciding upon the course adopted.

The amendment was defeated, and the resolution carried.

Cheaper Gas at Stoke-on-Trent.—At a meeting of Stoke-on-Trent Town Council last week, it was announced that the price of gas had been reduced for the current quarter by 6d. per 1000 c.ft., making it 3s. 2d. There is to be a reduction next quarter to 2s. 11d. per 1000 c.ft.; and in the near future it is possible there will be still further reductions.

A LIFETIME WITH MESSRS. GLOVER AND MAIN, LTD.

Mr. William Batt Retires, after Fifty Years' Service.

There was a homely little gathering of about forty of the Directors and staff of Messrs. Glover and Main, Ltd., at the Midland Grand Hotel, St. Pancras, on Saturday, March 1, when a dinner was given to Mr. William Batt, and presentations were made to him, to mark his retirement after fifty years' service with the firm. Mr. Batt was Manager of the Company's branches at Manchester, Newcastle, and Belfast, and has represented the firm on many occasions in Canada and the United States.

The gathering was presided over by the Rt. Hon. T. M'Kinnon Wood, P.C. (Chairman of the Company), and the Directors present were Lieut.-Col. W. R. Glover, C.M.G., D.S.O., Sir Paul Makins, Bart., Mr. Kenneth Aird, and Mr. Glover Clark. Mr. William Batt, jun. (of the Newcastle-upon-Tyne and Gateshead Gas Company), was also present.

The loyal toast having been duly honoured,

The CHAIRMAN, in presenting to Mr. Batt, on behalf of the Directors, a silver salver, said they had gathered together to do honour to their old comrade, whose connection with the firm covered the long period of half-a-century. They had not come to say "good-bye" to Mr. Batt, however; they had come to express their good will and their sincere hope that he might have many years of peace, comfort, and cheerfulness in his retirement. He was a wise man who knew how to use leisure, and Mr. Batt looked as though he were capable of employing to advantage that great and valuable gift. He would not be idle. Judging from Mr. Batt's appearance, his employment seemed to have been a healthy one, and he (the Chairman) hoped there were many present who would be able to make the same boast as Mr. Batt—that he had worked for fifty years in harmony with one particular firm, and had found his employment not only satisfactory, but healthy. In proposing the health of Mr. Batt, the Chairman hoped that the years to come would be many and happy.

The toast was honoured with enthusiasm.

The presentation was then made by the Chairman, amid loud applause.

The salver was inscribed as follows:

> "Presented by the Directors of Glover and Main, Ltd., to Mr. William Batt, on his retirement, as a memento of his fifty years' service with the firm. March 1, 1924."

Mr. A. J. CRICHTON (Secretary) then asked Mr. Batt to accept, from the staff, a silver tea and coffee service, as a mark of their esteem and regard. Fifty years' service with the Company was a record of which he might well be proud. Every member of the staff sincerely trusted that Mr. Batt would be spared for many years to come, and that he would enjoy excellent health in his well-earned leisure. With these remarks he associated the name of Mrs. Batt and members of the family. Mr. Batt would carry away with him the united good wishes of everyone. Old friends of his who were unable to attend the dinner had written letters expressing their warm feelings of regard, and asking that their best wishes should be conveyed to him.

The inscription on the plate was as follows:

> "Presented to William Batt, Esq., by the members of the staff of Glover and Main, Ltd., London, Manchester, Birmingham, Bristol, and Falkirk, as a token of their esteem and regard on his retirement after fifty years' service."

Mr. CRICHTON asked Mr. Batt also to accept a present for Mrs. Batt, which took the form of a handsome silver-backed dressing-table set.

Mr. BATT (who still looks comparatively young and vigorous), in expressing his thanks, said how much he appreciated the spirit in which these handsome presents had been given to him. He recalled many interesting and amusing events that had occurred since he had first joined the firm. He referred in glowing terms to the late Mr. John Glover, with whom he was associated in those days. There came a time, he said, when, at the age of about seventeen, he was dissatisfied with his position, and decided to give it up. He was going through the business, to learn how to test meters—which was not such a difficult matter then as to-day—and had been in the brass shop and other departments. Two days before he should have left, however, Mr. John Glover had offered him a post in the Manchester branch of the firm which he expressed his willingness to accept. The initial difficulties were many, and after some years of hard work and experience he had opened up various branch workshops. Had the business been his own he could not have worked harder; and, fortunately, he was blessed with a good constitution. The firm had been considerate in all matters and at all times. During the whole of his fifty years' experience he had never once received a letter from the firm blaming him for neglect of duty, and this was a very proud position for a man to be in. He had never had an inquiry without having eventually obtained an order, though in some cases he had had to work for years for it. He had persevered; and when one persevered, and received the encouragement that he had received from his Board at all times, one could not but do one's very best. In conclusion, he said that if there was anything he could do, he would be pleased to do it. He could not adequately thank those present for their expressions of good will.

Later, Mr. BATT proposed the toast of Messrs. Glover and Main, coupled with the name of Mr. M'Kinnon Wood. The toast was duly honoured.

The CHAIRMAN, in reply, confessed that he was ambitious for the firm. He wanted to see it hold its place in the first rank of meter makers in the country. It had occupied that position, and ought to continue to do so. He also wanted to see it in the first rank of gas-stove makers in the country. He was not at all dissatisfied with the progress of the last year or two. The Directors could do a good deal, but the staff could do a great deal more; and the success of every company depended upon the loyalty of its staff. He reciprocated Mr. Batt's good will, and thanked those present for the manner in which the toast was responded to. The Company desired to do all in their power to render it possible for the staff to give that loyal daily service upon which success and prosperity depended.

The final toast was that of "The Chairman," and was received with enthusiasm. It was proposed by Sir PAUL MAKINS, who said that since Mr. M'Kinnon Wood had returned to them, after having been a Minister of the Crown, there had been a marked increase in the efficiency of the Company. He had devoted a great deal of time and ability to it, and they all wished him long life and happiness, and hoped that he would be spared to occupy the chair for many years.

The CHAIRMAN, in a brief response, again emphasized the importance of maintaining the co-operation between the Directors and the staff that had existed in the past.

During the evening an excellent musical programme was rendered by Messrs. A. J. Crichton, F. T. Kennard, A. Holman, S. Hawes, W. H. Escott, S. R. Crowl, W. H. B. Helps, and Bryan Beaumont (all members of the staff); and a successful evening was brought to a close by the singing of "Auld Lang Syne."

BRIGHTON AND HOVE GENERAL GAS COMPANY.

Annual General Meeting.

The General Meeting of the Company was held at the Offices, No. 5, Great Winchester Street, E.C., last Friday—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. E. L. Burton) read the notice convening the meeting, and the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said that the accounts were of almost uniform excellence throughout. The business had increased over the preceding year by 6·67 p.ct., which meant that the Company had sold an additional 56 million c.ft. of gas. The price had been reduced by 1d. per therm, equivalent to £39,000 a year to the consumers. Within the last eighteen months there had been a number of reductions. From July 1, 1922, the price was reduced from 12½d. to 1s. per therm; on Oct. 1, 1922, from 1s. to 11d.; on Jan. 1, 1923, from 11d. to 10½d.; and on Jan. 1, 1924, from 10½d. to 9½d. During these eighteen months the consumers had been saved £118,000 odd. As to the capital account, there was an aggregate of something like £180,000 of redeemable capital. He mentioned this because it offered a favourable prospect to the Company in the future of being able, at the appointed time, to replace these stocks with others bearing a lower rate of interest. The capital account had been debited during the year with £28,500, of which sum £8000 was immediately afterwards written off by way of depreciation, to bring in a net debit to that account of something like £20,000; and if he recalled the figure of 56 million c.ft. increase in the sale of gas, it would be seen that the capital in relation to the business had been improved during the year by a not inconsiderable reduction. The total capital receipts amounted to £883,000, and this showed that they had £466 of capital employed per million c.ft. of gas sold, a very favourable figure—particularly coming, as it did, immediately after the reconstruction of the works, the elimination of old plant, the installation of more economical methods of manufacture, and the reconstitution of the distributing system. During the year one of the most notable things done in connection with the development of the business was to change the method of distribution almost completely, by the provision of an encircling high-pressure main, which commanded every portion of their very large district. It was difficult to say what the dimensions of the district were, because it was constantly changing, but it could not be far short of 18 miles long, and nearly 12 miles broad. The district was a difficult one to deal with, because they could never tell, in the prevailing conditions of spasmodic development, in what direction they might be called upon to meet the demand for gas. This had to be borne in mind in reconstituting the distributing system; and they had, they believed, installed and finished a system of high-pressure distribution which would cover, for many years to come, any development of the business in whatever direction it might arise. This, of course, was expensive. The main alone had cost £24,000. The total expenditure upon the four chief items of maintenance and repair amounted to over 2½d. per 1000 c.ft. Though it was heavy on this occasion, it would afford a considerable margin in the future for reduction. Referring to an item of £287 for law and official charges, he said litigation had been forced upon the Company, and had involved them in heavy expenditure; but the issue was successful, and it would be worth the money in the long run. The co-partnership charges amounted to £6619, and the charge for employees' sick and benefit and hospital provident funds was £1590. On the credit side of the revenue account, the total rental showed that they were £26,882 behind on the year. This was solely due to the reduction in the price of gas. There was a gain of £14,000 on residuals, so that there was a deficit on the credit side of the revenue account of £12,513. The expenditure was £11,201 less, and the profit was £1312 less. As to the profit and loss account, there had been brought in from the last account £33,216, and the balance to be carried to the next account was £44,212. With regard to the general balance-sheet, though the investments on account of reserve, special purposes, and benefit funds were shown as £91,727, the value on Dec. 31, 1923, was £105,536. On the other side of the account there was only one unfavourable figure—a loan from the bankers of £15,000; but it was hoped to eliminate this during the next six months.

PROSPECTS EXTREMELY FAVOURABLE.

The future prospects of the Company were extremely favourable. It could not be expected that the present increased business would continue. It was due to the cold weather, and also to the redistribution of pressures effected by the improvement of the distributing system. The latter had brought a steady increment, and would continue to do so for some time. There was much building at Brighton, and the Company could look for a reasonable increase in the sale of gas in that direction. Electrical competition was as keen in Brighton as in any other place he knew, and he did not think it would become more effective in the future. The undertaking was in the hands of the Municipality, and always took a certain amount of the lighting load; but the

use of gas for lighting purposes was something the Company never lost sight of. The Company went further than most undertakings, inasmuch as they assumed the maintenance of all lighting fittings, which was the only way to retain the lighting load in such a town as Brighton—and it was being retained in a very marked degree. Perhaps the Company's greatest strength was in the very moderate price of gas. The process of reduction had not yet reached finality. Though the Company could not commit themselves to anything definite, the same methods which had reduced the price to its present level would continue to be applied.

Mr. G. W. Carey (Deputy Chairman) seconded the resolution.

Mr. E. E. Kelsey suggested that the meeting should be held in Brighton, in order that more shareholders might be able to attend. He also asked the number of new consumers obtained during 1923.

Mr. Charles Webb inquired whether there were more shareholders in Brighton than in London. If there were more in Brighton, he would like to see the meeting held there. He did not think, however, that more people would attend in Brighton than in London, which was probably more convenient.

The Chairman said this question had been raised on several occasions, and it was the desire to consult the convenience of the majority. Only about 10 or 12 p.ct. of the shareholders resided in Brighton, and it seemed a pity to deprive the remaining 88 p.ct. of the opportunity of attending, for the sake of this 12 p.ct. The number of new consumers during the year was under 3000.

The report and accounts were adopted unanimously.

On the motion of the Chairman, seconded by Mr A. F. Phillips, the dividends recommended by the Directors for the half-year ended Dec. 31, 1923, were declared.

Mr. G. W. Carey and Mr. J. Cash were unanimously re-elected Directors.

Mr. Webb suggested that the stock might be converted, so that instead of paying, for instance, 11½ p.ct. on the original ordinary consolidated stock, there should be paid 5¾ p.ct.

The Chairman said this had not been overlooked, but the disturbance caused by the war had put the matter temporarily into the background. He agreed that such conversion would make the stock more marketable.

Mr. William Cash was unanimously re-elected an Auditor, and was also appointed Special Auditor to audit the accounts for 1923, in conjunction with the Special Auditor appointed by the Corporation of Brighton, under the Company's Act of 1866.

Hearty votes of thanks were accorded the officers and staff of the Company, and the Board of Directors.

EXETER GAS LIGHT AND COKE COMPANY.

The report of the Directors for the year 1923, which was submitted at the general meeting of the Company held on Feb. 25, stated that the sale of gas had increased by 110,031 therms—equal to just over 23 million c.ft. The Chairman (Mr. G. Hardy Harris), in moving the adoption of the report and accounts, said that, owing to the reductions in price effected in 1922 and 1923, the price to-day was only 36 p.ct. higher than pre-war, while the cost of materials, wages, &c., came to considerably over 86 p.ct. As to leakage, the Company had brought this down to 3½ p.ct. During the year, they had had 4125 additional gas-consuming apparatus on hire. The profit on their undertaking for the year was £9782, which, with interest of £1194, brought the total to £10,976. Against this was £2334 (income-tax), £384 (debenture interest), and £8114 (dividends), aggregating £10,841, and leaving a balance of £135 to be carried forward. The Company had been admirably served by the staff, and thanks were due to their Manager (Mr. W. N. Westlake). The following dividends were declared on the proposition of the Chairman, seconded by Mr. J. Gould Drew: 4 p.ct. per annum on the preference stock, 5 p.ct. per annum on the preference shares, 7 p.ct. per annum on the new ordinary shares, and 10 p.ct. per annum on the original stock.

New Scale for Domestic Gas at Bolton.

To encourage the use of gas for domestic purposes, the Bolton Gas Committee have adopted a reduced scale of charges. As with electricity, a minimum quarterly consumption, based on a normal lighting consumption for a given number of rooms, is adopted. This will be charged for at the ordinary rate. All gas above this will be priced at 2s. 6d. per 1000 c.ft. in the borough and 2s. 9d. outside. The minimum scale is:

Rooms.	June and September Quarters. C. Ft.		December and May Quarters. C. Ft.
4	2,000	..	4,000
5–6	4,000	..	6,000
7–8	6,000	..	8,000
9–12	10,000	..	12,000
13	12,000	..	16,000

South Staffordshire Mond Gas Company.—Mr. G. Macpherson, presiding at the annual meeting of the Company last week, explained that the modification of another section of the plant was completed during the year. When the demand for gas increased, this section would be put to work, with the result that gas would be produced still more economically. As opportunity offered, they would negotiate with the other gas undertakings in their area as to supplying them with gas in bulk. They would probably have to make an issue to get rid of the bank overdraft and provide working capital. With one exception, the sales of gas in January were better than in any month last year, showing that trade was improving. They sold during the year 11 p.ct. more gas, obtaining an increased revenue of £2883. The net profit was £9308, compared with £5176 in 1922. The bank overdraft was £52,211. This was £3380 less than the previous year; but in the circumstances a dividend on the preference shares was not recommended, though it was earned practically twice over during the twelve months.

PORTSEA ISLAND GAS LIGHT COMPANY.

The Half-Yearly Meeting of the Company was held on the 21st ult. in the Offices at Portsmouth—Mr. T. H. F. Lapthorn, J.P., in the chair. The profit and loss account showed an available balance of £54,868; and the Directors recommended that a dividend be declared for the six months at the rates per annum of 13 p.ct. on the "A" and "B" shares, 12 p.ct. on the "C" shares, 10 p.ct. on the "D" and "E" shares, and 5 p.ct. on the 5 p.ct. maximum stock (all less income-tax); leaving £36,185 to be carried forward.

The Chairman, in moving the adoption of the report and balance-sheet, said the receipts from the sale of gas were down by £10,275, the whole of which was due to the reduction in price, for they had, in fact, sold more gas. The receipts from the sale of residuals were up by £7294. The net cost of coal and oil during the past six months, as compared with the previous six months, was down by £10,104—a decrease of 0·76d. per therm, or 3·46d. per 1000 c.ft. During the six months, the Company made a gross profit of £45,959; and after deducting income-tax amounting to £6349, interest on debenture stock £4374, &c., and adding the sum brought forward from the previous half-year (less £20,000 allocated to the workmen's pension scheme) they finished up with a balance of £54,868 available for dividend. The sale of gas had increased by 324,666 therms, or 72,148,000 c.ft.—a gain of 7·59 p.ct. The output up to the present time this year showed a 10 p.ct. increase over the first seven weeks of last year. At the beginning of 1923 they had 38,043 cookers in use, and they finished the year with 40,146. They started the year with 5890 fires, and closed it with 13,688. Since Jan. 1 they had been sending out additional fires at the rate of over 100 a week. He announced a further reduction in the price of gas, as from the beginning of next quarter, of 0·4d. per therm, which would save the consumers about £16,000 a year. This was the seventh reduction they had made since October, 1921. The present price was 8·6d. per therm, and the reduced price would be 8·2d., equivalent to 3s. 0·9d. per 1000 c.ft., as compared with 2s. 4d. pre-war.

Negotiations had passed between the Company and the Corporation in regard to their standard price, which in 1921, when costs were almost at their highest, the Board of Trade had fixed at 1s. 4d. per therm. Having regard to the reduced cost of production, the Corporation felt (and the Directors agreed) that the time had come when the standard should be revised. The Council had accordingly sent forward a formal application to the Board of Trade for a reduction, and the new figure would be fixed by the Board. This decrease did not necessarily mean any lowering of the price which the Company would charge consumers for gas.

The report and accounts were adopted.

Sutton Gas Company.

Alderman E. J. Holland, D.L., J.P., presided at the annual general meeting of the Company held on Feb. 19. The revenue account, stated the Chairman, showed a balance of £16 573 for the year. An interim dividend of 3½ p.ct., less income-tax, had been paid in August, and the Directors recommended the payment of a final dividend of 4 p.ct., making 7½ p.ct., less income-tax, for the year. On April 1 the price of gas had been reduced from 11d. to 10d. per therm in the Sutton and Cheam area, and correspondingly in the outer districts, and a further reduction from 10d. to 9·4d. per therm had been made in October. The calorific standard of the gas had been increased from 460 to 480 B.Th.U. per c.ft. In June the Directors had made an issue of £11,980 5 p.ct. perpetual debenture stock, and part of that issue had been applied in replacing £4750 6 p.ct. redeemable mortgage debentures which had fallen due on July 1. The revenue account showed that £69,189 had been spent in the manufacture of gas, and £10,679 in its distribution. The sale of gas had brought in £72,407, the sale of products £27,890, and the rental of meters, stoves, lamps, and fittings £9581. Other accounts showed that 1,815,458 therms of gas had been made and 1,645,253 sold—an increase of 70,000 therms on the previous year. Of residual products, 19,196 tons of coke and breeze had been made, and 14,436 sold; in addition, 238,872 gallons of tar and 243 tons of sulphate had been produced.

Bognor Gas Company.—Maximum dividends for the past half-year have been declared by the Bognor Gas Company, leaving a balance of £10,423 to the credit of profit and loss account. A further reduction of 1·47d. per therm in the price of gas has been made; and the lighting rate for electricity (which has now been supplied by the Company for ten years) has been lowered 1d. per unit. The capital per million c.ft. of gas has been reduced from £900 in 1914 to £783 last year.

Barnstaple Gas Company.—At the annual meeting, the largest dividend ever paid by the Company was agreed to. The report showed a balance to the credit of profit and loss (net revenue) account amounting to £6048. The sale of gas had increased by 3½ million c.ft. over the previous year, and the price was reduced by 6d. per 1000 c.ft. as from June last, and 4d. as from the December readings; the present charge being 11·2d. per therm (4s. 8d. per 1000 c.ft.). Moving the adoption of the report, Mr. F. W. Hunt (the Chairman) said the results were encouraging, and might be regarded as among the most satisfactory in the history of the Company. The revenue account showed a considerable improvement over the previous year's figures. The outstanding feature of the year was that they had carbonized less coal and made more gas. As compared with 1922, the shareholders would receive an extra return of £3 10s. and £2 9s. on the two classes of shares. Looking at matters from the consumers' standpoint, the position was very satisfactory. Since March, 1922, the price of gas had been reduced by 2s. 2d. per 1000 c.ft. Alderman A. J. Reavell (the Deputy Chairman), seconding, particularly congratulated the Manager and Secretary (Mr. F. L. Schofield). The Chairman remarked that Mr. Schofield had for over 25 years devoted himself wholeheartedly to the interests of the Company.

GOSPORT GAS AND COKE COMPANY'S ORDER.

The inquiry by the Board of Trade into the application of the Gosport Gas and Coke Company for an Order under section 10 of the Gas Regulation Act was continued by the Director of Gas Administration (Mr. H. C. Honey) at the Offices of the Board on Monday, Feb. 25. [The previous hearing was reported in last week's "JOURNAL," p. 503.]

At the opening of the proceedings, Mr. WROTTESLEY, for the Gosport Corporation, asked for further information with regard to clause 34, which relates to the application of excess profits.

Mr. *W. Cash*, recalled on this point, said the clause provided for a carry-forward each year of a sum sufficient to pay a year's dividend and interest. Though the Model Bill provided only for a carry-forward sufficient to pay a year's dividend, the Board of Trade had sanctioned the clause in other cases. Speaking of his personal experience of the result of amalgamations, Mr. Cash referred to the Bournemouth and Poole, the Bournemouth and Christchurch, the Croydon and Carshalton, and the Croydon and Caterham amalgamations, and quoted the previous and subsequent charges for gas in the acquired areas, indicating that considerable reductions in price had taken place. As to the differential, he believed it was the intention of the Directors of the Gosport Company to charge the differential as agreed; but, though there ought to be a compulsion to charge it during the early years of the amalgamation, there should also be an option for the Directors to decide whether they would charge it or not after a certain period.

Mr. WROTTESLEY (who is asking that the differential should be compulsory in the present case, in the interests of the Gosport consumers) made the point that, as the Order stands, there is no compulsion to charge the differential in Fareham. Cross-examining on clause 34, with regard to the carry-forward, Mr. Wrottesley said that if the clause contained words to the effect that the amount in question should be one year's dividends at the rate according to the current price of gas, and not at the rate determined by the standard price, his clients would agree to the clause.

Mr. *Cash* said that was the intention.

Mr. *Arthur Valon*, Consulting Engineer, was then called for the promoters. He said the existing Gosport Works were well designed and in thoroughly good condition. The manufacturing plant consisted of six beds of 20-ft. through retorts, and the working capacity of the retort-house was about 720,000 c.ft. per day. It was the practice of the Gosport Company to supply 50 p.ct. by volume of coal gas and 50 pc.t. of water gas, so that the total capacity of the works for such a mixture was nearly 1,500,000 c.ft. per day, while the present maximum output was only 780,000 c.ft. The declared calorific value was 400 B.Th.U. per c.ft. The retort-house had room for three more beds of retorts, and the foundations for them had been put in. When these were constructed, it would bring the capacity of the house up to 1,080,000 c.ft. The gasholder capacity was 480,000 c.ft., or just over 60 p ct. of the maximum day's output. As the maximum day's output at Fareham was only 120,000 c.ft., the Gosport Works were ample to supply Fareham. The purifiers and general plant at Gosport, apart from the carbonizing plant, were also sufficient to deal with the increased output required by the amalgamation. Dealing with the consumption, witness said there had been a rapid increase in the gas sold at Gosport from 1916 to 1920, but since then there had been a falling-off, owing to the closing-down of certain Government establishments. The effect of this, of course, had been to increase the overhead charges per 1000 c.ft.; and, from this point of view, it would be an advantage to Gosport to acquire the Fareham undertaking, whose area adjoined that of Gosport. If the amalgamation took place, it was proposed to abolish the manufacture of gas at the existing Fareham Works, and to supply Fareham from Gosport by a high-pressure main; the distance between the two works being about six miles. The sale of gas in Gosport for 1922 was 186,260,200 c.ft., and in 1923 183,191,200 c.ft. In Fareham in 1922 the consumption was 28,952,000 c.ft., as compared with 20,700,200 c.ft. in 1913; and this steady increase would probably be accentuated after the amalgamation. On all grounds, he regarded this as a thoroughly sound proposition to put before the Board of Trade. The high-pressure main and compressors for supplying Fareham would cost £6000; but, as £2000 of this would be required in any case for dealing with the Gosport supply, he had not taken this proportion into account for the purpose of this case. The capacity of the Fareham gasholders was 76,000 c.ft., against a maximum day's demand of 120,000 c.ft. Coming to price of gas, Mr. Valon said that the existing price in Gosport was 10 8d. per therm, and, with the differential of 3d. per therm at first, the price in Fareham would be 13·8d.—a reduction of 2·2d. below the present price. At the same time, he did not suggest that the price of gas would not be reduced in Fareham if the Fareham Company went on alone; and this was a justification for the continual reduction of the differential, as now arranged until it reached 1·2d. per therm at the end of ten years. The authorized dividend for the Fareham shareholders with gas at 13·8d. per therm, however, would, on the present 8 p.ct. capital, be £10 16s.; and as the action of the Fareham Company in selling their undertaking had enabled this economy to be made, it was not unfair that the Fareham stockholder should get a correspondingly increased price for his stock. In a recent case, when the Uxbridge Company absorbed the Maidenhead Company, the old standard price and the old standard dividend remained in the Maidenhead area, so that the shareholders would in future obtain an increased dividend proportionate to the reduction in the price of gas owing to the amalgamation. In the Fareham case, the stockholders were taking fixed dividend stock, and the sum of £3200, to be distributed among them, was to be looked upon as compensation for the loss of their future increased dividend. As a matter of fact, this sum of £3200 by no means represented the actual difference between the assets and liabilities. The difference was much greater than this. As to the ten years compensation agreed upon for the Directors, this was one of the conditions upon which they would sell, though it was slightly higher than usual, eight years being the maximum that had been allowed. The amount had been fixed, however, having regard to the probability, amounting almost to a certainty, that the Directors' fees would have been increased in the near future. The period of ten years for the manager's compensation was usual, and witness made the point that, in considering compensation to officers in such cases, regard should be paid to the number of years service in the industry, and not with the particular company they happened to be with at the moment.

The differential, starting with 3d. per therm and ending with 1·2d. per therm at the end of ten years, was then dealt with; the view being expressed that at the end of that period it should be left to the option of the Directors whether they continued to charge the differential or not. Witness agreed that, at first, the amount required to cover the cost of supply in Fareham would not need the whole of the 3d. He had worked it out at 2·2d. per therm; but it was better to start on the safe side, and he did not think the Fareham Company alone could reduce the price of gas immediately to show a reduction which would leave a smaller differential than 3d. Moreover, if expectations of an increased supply in Fareham were not realized during the first year or two, the higher differential, while throwing no burden on the Fareham consumers, would assist the Gosport Company. As a matter of fact, the higher the differential, the better it would be for those opposing on behalf of the Gosport consumers. The risk of any loss falling upon the latter was, in any case, extremely small. In a comparison of the revenue accounts of the Gosport and Fareham undertakings, it was shown that the net expenditure per therm in Gosport in 1923 was 10·02d. with a 400 B.Th.U. gas, and 13·64d. per therm in the case of Fareham with a 450 B.Th.U. gas. With the Fareham gas manufactured in Gosport, the Gosport costs would be less, and the whole area would benefit. Figures were then given of the net extra cost—over the present Gosport figures—of giving the supply in Fareham, from which it was shown that, for the first nine years during which the differential would be charged, in decreasing amount, there would be small surpluses out of the differential, and in the tenth year there would be a slight deficit, taking the rate of progress in consumption during recent years. By that time, however, suggested Mr. Valon, the development would be much greater.

Mr. WROTTESLEY, for the Gosport Corporation, speaking of clause 41, which enables the Gosport Company to refuse a supply for industrial purposes where the main is not of sufficient capacity, said he would not persist in his objection to this clause if it were not applied to public lighting.

This was agreed to.

Mr. WROTTESLEY, cross-examining generally with regard to the objections of the Gosport Corporation, dealt first with the sliding-scale clause which provides for a quarterly slide. He suggested that this might induce the Company to reduce the price during a period of low consumption, in order to pay higher dividends, and generally to raise and lower the price from quarter to quarter, to the disadvantage of the consumer.

Mr. *Valon* said this would be impossible, first, because in a quarter of poor consumption the Company would not earn the money to pay a higher dividend, and, secondly, if there were any advantage, it would not outweigh the disadvantage of having continually to be notifying the consumers of changes in price.

A long cross-examination took place as to the development in Gosport, the suggestion of the Corporation Counsel being that there was no extension sufficient to justify any immediate large development of the gas-works. Counsel then suggested that no account had been taken of the staff needed in Fareham, but witness would not agree that there would be any extra expense in that connection which was not covered by the differential.

In the course of some questions, Mr. HONEY referred to the subject of compensation to Directors and Manager, and asked if the agreement would be adhered to if there were any material modification by the Board of Trade in the amount allowed for compensation to Directors.

Mr. *Valon* said that the ten years' compensation to the Directors was one of the terms of the bargain; but he would imagine that they would be content to leave the matter in the hands of the Board of Trade, provided no material modification was made.

Mr. HONEY stated that one of the difficulties was that compensation to directors and officers had been gradually creeping up until, he ventured to think, it was becoming unreasonable.

Mr. ABADY said he was authorized to say that any alteration in the terms of the compensation to the Directors, providing it was not material, would not affect the agreement to sell. This, however, did not apply to the compensation to the Manager, which was considered reasonable.

After the luncheon interval, it was announced that the opposition of the Misses Broadbank had been withdrawn.

Mr. ROWAND HARKER, who now agreed with the promoters, though originally objecting, said he was in a difficult position. In ordinary Parliamentary Bill procedure he would be a petitioner against alterations, and as such would have the right to be heard if the Committee made alterations affecting the agreement come to with the promoters. In the present case, the decision of the Board of Trade would not be made known until later, and he might then be prevented from stating his case.

Mr. WROTTESLEY said it seemed to him that if any alterations were made by the Board of Trade, they should not be given effect to until Mr. Harker had been given an opportunity of laying the case of the Fareham Council before the Board of Trade.

Mr. HONEY made no comment on these remarks, and it was then agreed to call Mr. G. Evetts—previously retained as a witness for the Fareham Council against the Draft Order—as a witness for the promoters.

Mr *G. Evetts* confirmed the views generally expressed by Mr. Valon as to the advantages of amalgamation of small companies, and the terms of the Draft Order as modified in regard to the differential and other points which had been agreed. He still, however, objected to ten years' compensation for the Directors, though he regarded a period of ten years' for the Manager as fair. On this latter point, Mr. Evetts made a comparison with a Government official, whose pension, he said, was not based on the number of years he had been in any one department, but on the time he had been a Government servant.

Similarly, a displaced official in the gas industry should have his compensation based upon the number of years he had been in the industry.

Mr. WROTTESLEY cross-examined as to the generous terms of purchase, but witness said that the question of maintainable profit did not arise in the case of purchase by agreement.

A discussion then took place upon clause 32, which increases the prepayment-meter charges as sanctioned in section 5 of a Special Order granted to the Gosport Company in 1923.

Mr. HARKER raised the point that, as the 1923 Special Order was made under section 1 of the Gas Regulation Act, and the present Order was being asked for under section 10 of the same Act, having regard to the wording of the two sections of the Act of 1920, he was not certain that the local authority would still retain its right of asking the Board of Trade to revise the charges which, under the 1923 Order, it had made under section 1.

Mr. WROTTESLEY agreed with this.

Mr. ABADY (for the Gosport Company) said he saw nothing in section 10 of the Gas Regulation Act which took away any powers under section 1; but, to make the position clear, his clients were willing to add words to clause 32 of the present Draft Order to the effect that nothing contained in that clause should be held to deprive the local authorities of any rights of revision of prices which they now possessed under section 1.

Mr. HARKER said he would be satisfied with this.

Mr. WROTTESLEY then raised another aspect of clause 32, dealing with prepayment charges. The prepayment charges were now being increased because the promoters said that they had miscalculated when applying in 1923 to the Board of Trade for their Order under section 1 of the Gas Regulation Act. The position, however, in regard to that Order, which fixed the therm price for the Gosport Company, was that the Gosport Corporation withdrew their opposition on the basis of an agreement as to the therm price for which the Company should ask the Board of Trade. This price included the prepayment charges; and if the latter were to be reconsidered now, then he regarded it as a breach of an agreement, and the whole question of the Company's price should be re-opened.

Mr. ABADY said the agreement in 1923 was as to the new standard price, and had nothing to do with the prepayment charges.

Mr. HONEY asked whether the Gosport Corporation, when they agreed, stipulated that there should be no increase in the prepayment charges.

Mr. WROTTESLEY said that the agreed schedule put before the Board of Trade when the Order was asked for by the Gosport Company included revenue from all sources, and therefore included prepayment charges.

Mr. W. R. HERRING remarked that at the opening of the inquiry into the 1923 Order, it was specifically stated that there was no intention to increase prepayment charges. The standard price which he then suggested was from 11·5d. to 11·74d., whereas the Company asked 15·83d. Eventually, it was agreed at 12·25d.; but no details were discussed.

Mr. WROTTESLEY formally asked the Director either to open the whole question of charges or to dismiss the matter.

The inquiry was then adjourned until Monday, March 3.

SMOKE AND SUNLIGHT.

[A Lecture dictated by Dr. C. W. Saleeby on Feb. 11 for Broadcasting.]

"In the beginning, God said, Let There Be Light."

Long ages ago the Persian, Zoroaster, taught people to worship the sunshine. In the beginning of medicine, Hippocrates treated ill people by taking them out into the sunshine, making them do exercises, and giving them simple food; and they quickly got well. It is a great pity that, after his time, we should have forgotten the sunshine for more than 1000 years, and have spent our time using all sorts of nasty medicine in the shade, and practising superstition of all kinds.

In the Nineteenth Century, the greatest English woman who ever lived, Florence Nightingale, protested against the building of Netley Hospital so that no sunshine could ever enter its wards, but I am sorry to say that her protest was not heard. No architect or doctor supported her, and she was wiser than them all. John Ruskin protested against "smoky" cities, and praised the sunlight; and people thought he was a crank.

Then there came along a young Danish doctor called Finsen, and he treated tuberculosis of the skin by sunshine, with wonderful results, in Copenhagen; and twenty-one years ago we took to the same practice at the London Hospital—thanks to Queen Alexandra, who was naturally proud of her young fellow countryman. I am not here to praise artificial light of any kind, however useful, because I know that the sunlight is better than anything artificial, and we have to learn how to run our homes and our cities so as not to interrupt the sunshine on its way.

The best proof of what the right things can do is to be found in Switzerland. I have just returned from my third long visit to that wonderful place where Dr. Rollier for the last twenty years has been curing desperately ill people, after all kinds of operations, and so forth, have failed, by putting them out in the sunshine; and I have seen lots of happy children being built-up for health and strength by what he calls "The School in the Sun."

And I want to have such schools in the sun all over England; only, if we are to do that, we must let the sunlight reach England. Our own sunlight is quite good enough, if it gets a chance. There are one or two places, like the Treloar Hospital in Hampshire, where our English sunlight has been proved to do wonders. What a pity we do not allow the sunlight to reach the Children's Hospital at Great Ormond Street in London, or any hospital in any of our cities! No artificial lamps are going to take the place of the light of day. We may use them to carry on with in cloudy weather, when they are much better than nothing; but sunlight is best.

The first idea was that sunlight killed germs—and that is true. It is the best antiseptic. Wherever it is allowed to fall, unspoiled by smoke, upon streets, playgrounds, and elsewhere, it kills all germs, and nothing can equal it as an antiseptic. The cheapest, oldest, safest, and best cure—it is more than that, it strengthens and builds us up so that we are able to kill our own germs for ourselves. Sometimes, when the sunlight has been used as an antiseptic and has failed, it succeeds when the patient's clothes are taken off and his skin is exposed and given a real bath of light. After a time he becomes so strong that the germs cannot touch him any more.

I have lately visited various countries where the sunshine gets a fair chance—for instance, Canada and Finland. We have just been noticing what splendid records these people are making in the Olympic games, leaving us nowhere. They do not live in cities which are deprived of more than half their sunlight by the smoke every winter, and they do not suffer as we do from what I call the "Diseases of Darkness." When we examine our big cities, we find that they are shameful in this respect. American cities have been cleaned up. I found that New York had been made smokeless as part of the fight against consumption, and for years I have maintained that London, and all our cities, should be made smokeless too. We make our horrible fogs ourselves; and whenever the weather helps us, it is found that the death rate from bronchitis and pneumonia jumps up about a fortnight afterwards. Young and old people are the hardest hit.

I have just published a little book called "Sunlight and Health," in which I have covered the whole of this ground. To night I have only very little time, but time enough to say this: We must build our new houses and our new cities so that women shall have a fair chance—so that they shall not spend their lives in making dirt and chasing it about, and so that the light of day shall be allowed its chance to serve our lives, especially the lives of young people. This can be done. I live in a smokeless house myself, and I have never made any smoke. I have been in smokeless cities in many countries, and I know no reason why we, in this country, should be deprived of the blessings of sunlight.

It is all very well to praise the hospitals, and to subscribe to them—they are splendid institutions. I am happy to know that Lord Kinnaird, inspired by some demonstration of my own, was able to raise large sums of money for artificial light at the London Hospital. This from the generous people who listened to the wireless lectures. But he would agree with me that best of all would be to abolish the causes that produce diseases which fill the London and other hospitals. We want, not more hospitals, but more health; and for that we must learn the laws of life, and obey them.

Our ancestors did one splendid thing for which we can never be too grateful—they supplied pure water to our cities, and all those horrible diseases which are caused by infected water disappeared. All over the world, where people have sense enough, they have profitably benefited. We were the pioneers, but in respect of light and air we are the worst offenders in the world, and there is no excuse for it. We have a climate which is by no means too bad, if we would give it a fair chance, but it is not giving it a fair chance to foul the air and cut off the blessed light and make our country into a land of the shadow of death for all who live in cities—and that means four people out of every five.

The next big thing we have to do in England—and this is the moment to begin, when we are building and equipping new houses—is to see that we restore sunlight to our city lives and abolish the diseases of darkness. We must go on learning how to use the light, and then we must apply our knowledge. Cure is all very well, but to have no need for cure is decidedly better.

I want it to be said of us that "the people that walked in darkness have seen a great light, and they that dwell in the land of the shadow of death, upon them hath the light shined."

TRADE NOTES.

Messrs. Meldrums' New Publications.

Two new descriptive pamphlets have recently been issued by Messrs. Meldrums. Ltd., of Timperley, describing their forced-draught furnaces and centrifugal acid pumps. Both publications are concisely written, so that the matter may be quickly grasped; and the illustrations are well chosen.

Askam-in-Furness Gas-Works.—At the monthly meeting of the Dalton Urban District Council, there was some discussion respecting the Askam Gas-Works, and eventually the recommendation of the Highways and Lighting Committee was approved—that the Gas Manager canvass householders for the installation of gas for lighting and cooking, on the understanding that the fittings for lights will be provided free, and a cooker installed on the hire-purchase system. The Manager (Mr. R. Vickers) has prepared a report dealing with the capacity of the existing plant, and the directions in which extensions will be desirable to cope with an increased output.

Cork Gas Consumers' Company.—The general meeting of the Company was held on Tuesday of last week—Mr. W. B. Haughton (Chairman) presiding. The Chairman, in proposing the adoption of the report and accounts, said that the sale of gas was 7·41 p.ct. over that of the final six months of the previous year. The sale of gas in 1923 was the highest in the history of the Company, showing more than 33 p.ct. increase on 1897. Their price for gas was only 60 p.ct. above pre-war, though their wages were more than 200 p ct. greater. Though they had made two reductions in the price of gas during 1923, the rental account for the past half year showed a satisfactory increase. This was partly due to the abnormal sale of gas for cooking purposes, &c., owing to the scarcity of coal during industrial troubles in the earlier months of the half-year. After placing £1644 to the credit of the depreciation fund, the balance of profit and loss was £4386, with which it was proposed to pay a dividend at the rate of 8 p.ct. per annum.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The past week has shown an improving tendency in this market, and a partial recovery from the set-back due to the dockers' strike. While all are agreed in hoping that trouble in the mines may be avoided, the demand which is bound to exist until a settlement is in sight has been in evidence. This demand for stocking purposes was only temporarily kept back by tonnage shortage during the strike, and would appear likely to increase as time goes on.

Northumberland steams have been a stronger market, some qualities having increased as much as 1s. Durham coking has advanced from its recent low quotation of 22s. to 22s. 6d. for good qualities (even at this figure it was at one time practically unsaleable), and 23s. 6d. is asked for March shipment.

Gas has been a firm market, and Wear Specials are asking 25s. to 25s. 6d. Best qualities (Holmside, Boldon class) have done 25s., which they are now quoting, but which is not easy to get. Tonnage is in plentiful supply, and colliery books are well-stemmed for the next few weeks, so that everything points to buyers having to pay full prices for any new business they may wish to place, so long as the risk of a stoppage is overhanging the market.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

The menace of a coal strike appears to be dominating the market, with the result that all qualities are ruling firm. House coals are in great demand, while industrial concerns are chiefly looking to stocks for eventualities.

Gas undertakings are buying ahead at increased prices; screened descriptions for open market sale being about 22s. per ton at the pit. Gas nuts are from 21s. to 25s. at the pit.

The shipping demand has to some extent fallen off, owing to the high rates of exchange which prevail to the near Continent.

Furnace coke has depreciated considerably more than gas coke.

COAL TRADE IN THE MIDLANDS.

From a Local Correspondent.

Market conditions are still strained through the shortage of supplies. Very little relief has been forthcoming from the suspension of exports during the dockers' strike, owing partly to the difficulty of changing the machinery of distribution and partly to the prevalence of influenza among the miners, which has reduced the output. An unusually large proportion of the men at Midland pits are still reported sick. Transport confusion has likewise lowered the output. Numerous cases have occurred in which operations have been retarded by the non-arrival of wagons as they were required. The stringency in gas coals is not relieved to any appreciable extent. It is aggravated by an insistent demand for household coals. Contract deliveries are much in arrear. Ill-provided gas-works engineers have been glad to pay prices 3s. and even more above the normal rates, to escape from the immediate difficulty. With a heavy lighting load and a growing consumption of gas for heating and industrial use, contractors have been besieged with demands for deliveries far exceeding the carrying capacity available.

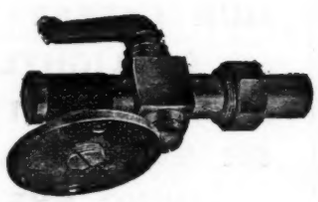
Gas coke is as difficult to obtain as ever; but there is an easier tone in furnace cokes, supplies being procurable at 26s. 6d. at ovens. Arrangements have been made for a conference between representatives of the cokeries and the associated blast-furnacemen in the Midlands regarding the price basis to be fixed on the expiration of the present stabilization agreement at the end of March.

Cheaper Gas at Maidstone.—At a meeting on Thursday last, the Directors of the Maidstone Gas Company decided to reduce the price of gas in Maidstone by 0·8d. per therm, from 10·4d. to 9·6d. per therm—such reduction to take place from and after the readings of the meters for the March quarter. Corresponding reductions are announced for the out-parishes.

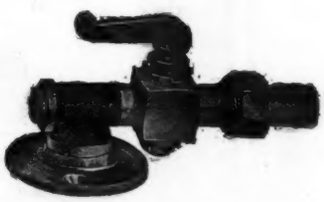
Eckington and Mosborough Gas Company.—Presiding at the ordinary general meeting of the Company, held last week, Mr. T. Greensmith said the financial position was very satisfactory. He foreshadowed a reduction in the price of gas, as it was considered that the system of supplying Eckington with coke-oven gas from the Holbrook Colliery was now beyond the experimental stage. The report was adopted.

Southgate and District Gas Company.—The Directors' report for the year ended Dec. 31, 1923, to be presented at the general meeting which will be held in London to-morrow, shows that an increase of 10·3 p.ct. has been made in the sale of gas. The sales of residual products show an increase of £2654. On Jan. 1 last the declared calorific value of the gas was increased from 475 to 500 B.Th.U. per c.ft., and from this date also the price was reduced by 1d. per therm. Glancing at the accounts, it is seen that, after providing for interest and income-tax charges, the balance of profit is £14,312, from which interim dividends for the half-year ended June 30, 1923, were paid at the following rates: On the preference capital 5 p.ct.; on the original capital, 10 p.ct.; and on the additional capital, 7 p.ct. per annum (all less income-tax). The Directors will recommend the declarations of dividends for the half-year ended Dec. 31 last at the same rates. The interim and final dividends, and the tax thereon, amount to £8650, leaving £5662 to the credit of profit and loss account to be carried forward to the current year.

TWO-WAY GAS FIRE TAP



USED AS STRAIGHT-WAY TAP



USED AS ELBOW TAP

The alteration is made by changing the position of screwed plug.

SAWER AND PURVES

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CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 3.

More interest is now being taken in pitch, and buyers have advanced their ideas of value to about 70s. per ton. Creosote continues a firm market at about 10d. per gallon. Tar spirits are quiet. Solvent naphtha, 95-160, is about 1s. 7d. to 1s. 8d per gallon. Pure toluole and pure benzole are about 1s. 10d. per gallon. Other products are without change.

Tar Products in the Provinces.

March 3.

There has been an improvement in the market for pitch during the past week. Prices are a little firmer and the inquiry considerably better, both for prompt and forward position. Other articles remain about the same.

The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 55s. Pitch, East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, 60s. to 62s. 6d.; Liverpool, 61s. to 63s. 6d.; Clyde, 62s. to 64s. 6d. Benzole 90 p.ct., North, 1s. 4½d. to 1s. 5d.; crude 65 p.ct. at 120° C., 9½d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 11d. Toluole, naked, North, 1s. 4d. to 1s. 5d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 2½d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 8¼d. to 8½d.; salty, 8d. to 8¾d.; Scotland, 7¾d. to 8d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Dundalk Gas Company.—The Directors of the Company have declared a dividend of 20s. per share on the "A" shares, and 15s. per share on the "B" shares. These are the same rates as last year.

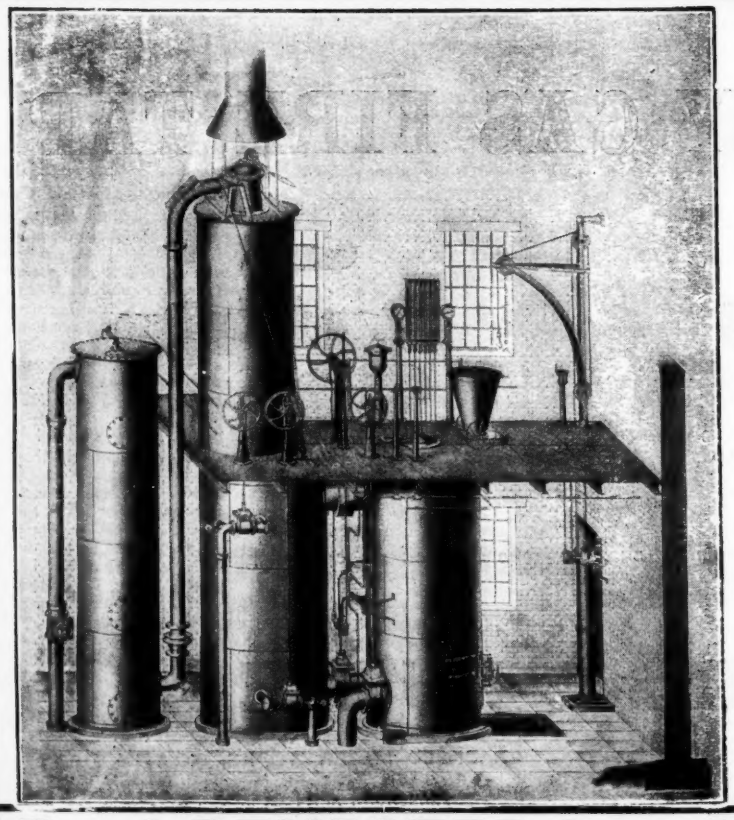
Fenny Stratford Gas Light and Coke Company, Ltd.—The general meeting of the Company was held a week last Tuesday. The revenue account showed a balance of £3217, and £500 has been placed to reserve of maintenance of mains and services account. The balance to the credit of profit and loss account was £6070, and the Directors recommended the payment of dividends at the rate of 5 p.ct. per annum, together with a bonus of 2 p.ct. (less income-tax). There has been a satisfactory increase in the sales of gas during the year (exceeding 5 p.ct.) and the price has been reduced as from December, 1923, by 5d. per 1000 c.ft. A tar-dehydrating plant has been erected and put to work, enabling the Company to supply tar in a more saleable condition.

Whitby Gas Company.

At the annual meeting of the Company, Mr. Richard Smailes, J.P. (the Chairman), submitting the accounts for the year ended Dec. 31, said the Directors were pleased to report that the business of the Company continued to expand, and that the demand for gas was greater than ever in the past. They sold more gas last year than during 1922, the increase being largely attributable to slot consumers. The receipts for residuals showed a slight increase, mainly due to the better price obtained for tar. Unfortunately, sulphate of ammonia remained, as during the past few years, an unprofitable commodity, and, like many more gas undertakings, they had not been able to obtain anything for ammoniacal liquor. Turning to the expenditure, they would perceive that coal cost less by about £480, largely due to improved results obtained in the works. Owing to the expansion of the business during the past few years, the present purifiers were too small and entailed considerable extra labour, in addition to causing anxiety to the Manager (Mr. W. M. Galleway); and the Directors were considering the question of the erection of larger ones. Some four years ago, the Board were faced with a large expenditure on carbonizing plant, and it was considered advisable, instead of issuing new capital to meet this expenditure, to arrange for an overdraft with the bankers, place the amount to a suspense account, and write off from revenue account annually a substantial sum until the plant was paid for. The Directors were pleased to report this had now been accomplished, by writing off the balance of £1500. The report and accounts were adopted, and dividends were declared for the half-year at the rates of 3 p.ct. on the original and £2 2s. p.ct. on the additional and new additional capital (both less income-tax), making 6 p.ct. and £4 4s. p.ct. respectively for the year.

Further Price Reduction at Hull.—The Directors of the British Gas Light Company, Ltd., announce that, from and after the reading of the indices of the meters for the current quarter, the price of gas at Hull will be further reduced from 7½d. to 7d. per therm.

Worthing Gas Light and Coke Company.—The half-yearly meeting of the Company was held on Feb. 23. Mr. W. Cash (Chairman), in moving the adoption of the report and accounts, said that the past half-year had been a satisfactory one. The sales of gas had increased 9½ p.ct., and its price had been reduced to 1s. per therm. They had put £495 to the renewal fund, and there was a new item in the co-partnership scheme, which was greatly appreciated by the men. Gas sales were down by £494, due entirely to the reduction in price; but meter and stove rentals were up by £162, which was proof of an expanding business. They had expended £6090 on a new purifier, and were engaged in providing new showrooms in Chapel Road. In the half-year 105 new houses had been piped, and they had provided 161 new meters, 147 services, 197 cookers, and 300 additional fires. The Chairman moved that a dividend at the rate of 6 p.ct. be declared.



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Birmingham Gas Department Capital Outlay.—The Birmingham Gas Department, in a report to the Finance Committee, state that schemes approved by the Council total £401,655, and the amount expended to the end of last year was £79,381. Of the £401,655, a sum of £347,655 is required for the erection of gasholders and the diversion of a river, and £54,000 for a trunk main to Sutton Coldfield.

Littlehampton Gas Company's Capital Issue.—Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., ask for tenders (to be received by them not later than Tuesday morning, March 11) for a new issue of £7700 of 6 p.ct. redeemable debenture stock in the Littlehampton Gas Company. The minimum price of issue is par, and the stock is to be redeemed at par on Jan. 1, 1932. The money is required for extensions necessitated by the increasing demand for gas.

Matlock District Gas Company.—The annual meeting of the Company was presided over by Mr. T. Wright, J.P. The report showed that the income for the year was £30,235. The profit on revenue account was £6874, and the Directors recommended a dividend of 8s. 10½d. per share (making 6 p ct. for the year), carrying forward £8303, as against £4696 a year ago. It was announced that the price of gas had been further reduced as from Jan. 1 by 5d. per 1000 c.ft.

Blackpool Gas Profits.—The Blackpool Gas Committee were informed on the 28th ult. that the Acting Manager (Mr. J. H. Chew) estimated a profit for the financial year ending March 31 of just over £28,000—£5000 more than last year, and a record in the history of the department. It was stated that Blackpool's price was among the lowest in the country, despite the huge profit, and that a reduction to come into operation this quarter would represent a saving to consumers of £18,000. It was estimated that the profit for next year would be about £4000, owing to the reduced price charged and the increased cost of coal, &c.

Public Lighting of Redruth.—The Redruth Urban District Council received with surprise a letter from the Electric Power Company intimating that, from the end of the quarter, they propose revising their charges for street lighting, including a fixed charge of £2 10s. per lamp per annum for not fewer than 220 lamps. The Clerk (Mr. G. P. Paige) said this meant that the standing charges alone would cost the town £557 10s. a year, and he estimated the cost of lighting to be another £200 or £250. Mr. P. R. Bowden (the Chairman of the Lighting Committee) said all over the country the cost of light had been reduced, and some of them were amazed that, so long after the war, when prices were getting normal, the town should be faced with this serious increase in its lighting bill. Mr. J. Corke, who alleged that there was much dissatisfaction in the Camborne and Redruth districts as to the charges, said that, if the Company insisted upon these revised prices, the Council should obtain an estimate from the Redruth Gas Company of the cost of lighting the streets by gas. It was decided to ask the Company to allow the present charges to continue until the end of the lighting year, in order to give the Council time to consider the matter.

Elland Gas Company.—At the annual meeting of shareholders of the Elland-cum-Greetland Gas Company, the Chairman (Mr. W. E. Dyson) said the revenue was £3365 less than in the previous year, due to a reduction of 2·6d. per therm in the charge for gas; but the year had been so satisfactory that the Directors were able to make a further reduction of 1d. per therm for the ensuing year. A dividend of 7⅞ p.ct. was approved.

Andover Lighting and Power Company.—An increase of about 1½ million c.ft. in the quantity of gas made during 1923 was reported at the annual meeting of the Company; but the Chairman (Mr. W. P. Clarke) pointed out that, owing to the reduction in price, receipts from gas were slightly down. The charge for power from the end of this quarter will be 11½d. per therm, subject to a sliding-scale of discounts according to consumption. A dividend at the rate of 5 p.ct. per annum was declared. The Manager (Mr. Stephen Temblett) said the policy of the Directors for many years had been to serve the town with a good article and extend the supply so that more could have the benefit of it, rather than to pile-up dividends. In other words, the object of the Company had been to serve the town and advance its interests, rather than to seek large profits for the stockholders.

The electric light failed at Woolwich at 9.30 last Saturday night, owing to a temporary breakdown at the Council's generating station. Most of the shops were shut; but for some moments there was confusion in Beresford Square, which was crowded with late shoppers. The current was restored shortly before 10 o'clock.

Scarborough electric light consumers are in high dudgeon because the price is 1s. per unit, and because the Company, who have made £15,000 clear profit, do not promise any reduction. A meeting, attended by about a hundred consumers, passed last week a strong resolution protesting against the excessive charge, and calling on the Town Council to place the subject before all electricity consumers, and have a full inquiry into the matter.

Before the Halifax Rotary Club, on the 27th ult., Mr. J. Wilfrid Drake, head of Messrs. Drakes, Ltd., gave an address under the title of "A Talk on Gas-Works Plant and Machinery," and described various kinds of equipment in use as far back as 1850. With the aid of drawings, he explained the old methods of charging and discharging retorts by hand, and proceeded to describe the gradual evolution to the modern machine methods. He explained the distinctive differences between horizontal, inclined, and vertical retorts, and went into details regarding the process of gas manufacture. Mr. W. B. M'Lusky (the Halifax Corporation Gas Engineer), who is an enthusiastic Rotarian, spoke subsequently, and paid tribute to the services which the firm of Drakes, Ltd., have rendered to the gas industry, and thereby to the community.

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

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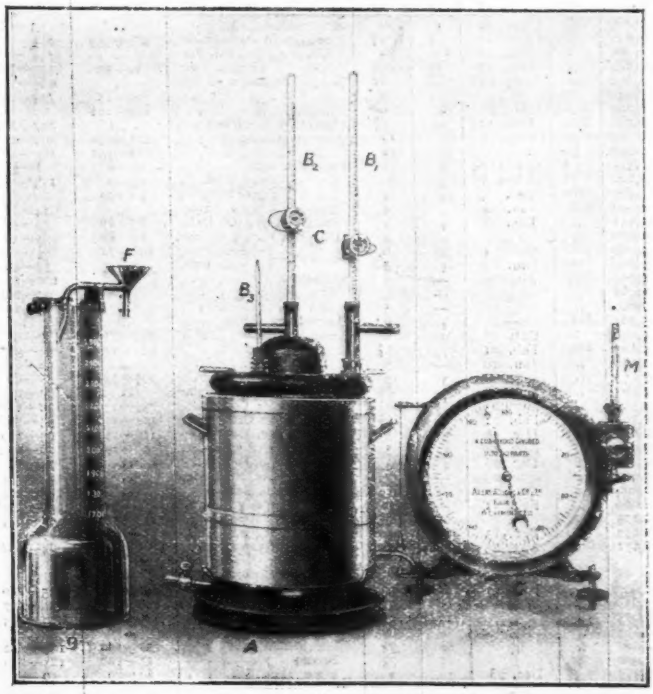

STOCK MARKET REPORT.

The Stock Exchange at the beginning of the week was a little apprehensive as to the result of the Poplar debate; but the Minister of Health created a good impression by his powers of debate, and the Government, thanks to the unexpected Liberal support, averted defeat. Business continued on the small side; and it is not to be expected during the current month—the last of the financial year, with the consequent ingathering of taxes—that there will be any material improvement.

There was very little variation in prices of the high-class investments during the week. War Loan, however, continued in demand, and business was marked up to 101 on Friday. The Austrian Loan received a good deal of support, and was marked up to 9 premium. Stag selling of the New Japanese Loan tended to reduce the price; but it found many buyers at 3 premium. Following the excitement of the dividend announcements of the previous week, Home Rails were quiet. The effect of the definite settlement of the Dock dispute was tempered by the obvious signs of further labour difficulties the principal of which are the claims of the miners and building trade operatives. These adverse factors are bound to have a depressing effect on industrial securities, and there are many warnings of possible increases in the prices of commodities.

Gas stocks were firm; a good impression being made by the reports of the chairmen of the various companies of the largely increased demand for gas appliances, which, assisted by the continued cold weather, has brought about exceptional increases in the consumption of gas. The changes in the quotations during the week were: Rises—Plymouth and Stonehouse 2 points, to 107-112; Wandsworth "A" 3, to 135-140; "B" 2, to 112-117; Wimbledon 5 p.c. 2, to 107-112; Epsom 5 p.c. 5, to 115-120. Falls—Gas Light ordinary ¼, to 90½-92½; Montevideo 1, to 53-58.

The following transactions were recorded during the week: On Monday, Alliance and Dublin 69, 69⅜, Bahia-Blanca 4s., 4s. 3d., Bombay 5⅛, Brentford "B" 98½ *ex* div., Commercial 4 p.ct. 95½, Continental Union 28, 28⅛, European 6, 6½, Gas Light and Coke 91, 91⅛, 91¼, 91½, 91⅜, 92, 92⅛, 3½ p.ct. maximum 61, 4 p.ct. preference 77⅜, 78½, Imperial Continental 145, 145½, 145⅜, 146½, Montevideo 55½, Primitiva 8s. 3d., 5 p.ct. preference 34s. 6d., 34s. 9d., South Metropolitan 95, 95⅜, 95⅝ *ex* div., 3 p.ct. debenture 59½. Supplementary prices, Colombo 11⅜, 11⅞. On Tuesday, Alliance and Dublin 68, Bournemouth "B" 12½, 12⅜, 4 p.ct. debenture 77½, 78, Brentford "A" 100 *ex* div., British 122, Commercial 3 p.ct. debenture 58½, Continental Union 28⅛, Croydon 103, Gas Light and Coke 91, 91¼, 91⅛, 91⅜, 91⅛, 92, Imperial Continental 145, 147, Primitiva 8s. 1½d., 5 p.ct. preference 34s., 34s. 3d., 34s. 6d., South Metropolitan 95½ *ex* div. On Wednesday, Alliance and Dublin 4 p.ct. debenture 62⅜, Brighton and Hove "A" 130⅜, Commercial 3⅜ p.ct. 96, 3 p.ct. debenture 57⅜, Continental Union 28⅛, 28⅜, 28½, European 6, 6 1/16, 6⅛, Gas Light and Coke 91, 91⅛, 91⅜, 4 p.ct. preference 78⅛, Imperial Continental 146, Primitiva 5 p.ct. preference 34s., 34s. 9d., South Metropolitan 95, 95¼, 95⅛, 95⅜, 96, 96⅛ *ex* div. Supplementary prices, Croydon 7⅛ p.ct. preference 104, 104¼. On Thursday, Alliance and Dublin 68⅜, British 121, 4 p.ct. debenture 75, Commercial 3½ p.ct. 95, 96, European 6, Gas Light and Coke 90⅜, Imperial Continental 145, Montevideo 54, Primitiva 8s., 5 p.ct. preference 34s., 34s. 1½d., 4 p.ct. (Buenos Ayres) debenture 55½, 56⅛, South Metropolitan 96 *ex* div. Supplementary prices, Brentford 6 p.ct. mortgages 98, 98½. On Friday, Alliance and Dublin 68¾, 69½, Commercial 4 p.ct. 94½, 3½ p.ct. 95, 3 p.ct. debenture 57⅛, Continental Union 28, Gas Light and Coke 90⅝, 91, 91⅛, 91⅛, Imperial Continental 145, 146, Montevideo 54, 54⅛, 55, Primitiva 8s. 1⅛d., 5 p.ct. preference 33s. 6d., 34s., San Paulo 6 p.ct. preference 53 27/32, South Metropolitan 6½ p.ct. debenture 104 1/16. Supplementary prices, Ascot 10 p.ct. maximum 7⅞.

The Foreign Exchange Market was on the quiet side. The steps taken by the French Finance Minister to restrict forward sales of francs was possibly the cause of less violent fluctuations than during the previous week. The feature of the "neutral" exchanges was the weakness of Spanish currency; the Madrid rate rising to 34.20½. The dollar-sterling exchange showed little variation, and closed on Friday at 4.30 5/16.

Easier conditions prevailed in the Money Market on Friday, notwithstanding that it was the last day of the month. Treasury Bills were allotted at a lower rate; the average quotation being £3 6s. 4·84d. p.ct., a reduction of 2s. 6·95d,

The Silver Market was quiet: the cash price closing at 33 7/16d. per oz.—⅛d. below that of the previous week.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Feb. 29.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Feb. 7	—	5	Aldershot 5 p.c. max. C.	..	70—75	...
217,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	67—72	68—69½
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	76—79	60—65	62½
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5⅛—6⅛	5—5⅛	5⅛
100,000	10	Aug. 9	—	8½	Bournemouth Gas and Water: 5 p.c.	..	12½—13½	...
383,110	10	,,	7	7	Bournemouth Gas and Water: B 7 p.c.	15—15½	11½—12½	12¼—12½
115,000	10	,,	6	6	Bournemouth Gas and Water: Pref. 6 p.c.	13½—14	11—12	...
162,025	—	Dec. 28	—	4	Bournemouth Gas and Water: 4 p.c. Deb.	..	75—80	77½—78
992,045	Stk.	Feb. 21	—	6½	Brentford A Consolid.	..	96—101*	100
734,920	,,	,,	—	6½	Do. B New	..	96—101*	98½
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	89—94*	...
221,400	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	91—93	76—81	...
214,740	,,	Aug. 23	11	11½	Brighton & Hove Orig.	208—213	175—180	...
244,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	127—132	130⅜
1,287,500	Stk.	Feb. 21	—	5	Bristol 5 p.c. max.	..	90⅛—91⅛*	...
855,000	,,	—	—	—	British Ord.	..	120—125	121—122
100,000	,,	—	—	7	Do. 7 p.c. Pref.	..	120—125	...
120,000	,,	Dec. 28	4	4	Do. 4 p.c. Deb. Stk.	88—90	73—78	75
100,000	10	,,	—	6	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	105—110	...
157,150	,,	Aug. 9	5	5	Chester 5 p.c. Ord.	108—110	85—90b	...
1,513,280	,,	July 26	5/9/4	6	Commercial 4 p.c. Stk.	106—108	92—97	94½—95½
560,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	92—97	95—96
475,000	,,	Dec. 13	3	3	Do. 3 p.c. Deb. Stk.	69½—71½	56—60	57½—58½
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	28—33	28—28⅛
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	78—83	...
660,000		Aug. 9	—	6½	Croydon sliding scale.	..	102—105	103
284,975		,,	—	5	Do. max. div.	..	85—88	...
492,270	Stk.	Feb. 21	6	4½	Derby Con. Stk.	123—125	108—110c*	...
55,000	,,	Jan. 12	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	—	—	5	East Hull 5 p.c. max.	..	..	...
1,003,180	10	Jan. 24	10	2	European, Ltd.	17½—18	6—7	6—6½
16,546,120	Stk.	Feb. 7	4/17/4	5½	Gas and Light and Coke: 4 p.c. Ord.	98—102	90¼—92¼	90⅛—92½
2,600,000	,,	,,	3½	3½	Gas and Light and Coke: 3½ p.c. max.	76—79	60—63	61
4,062,235	,,	,,	4	4	Gas and Light and Coke: 4 p.c. Con. Pref.	96—99	76—79	77⅛—78⅛
4,761,930	,,	Dec. 13	3	3	Gas and Light and Coke: 3 p.c. Con. Deb.	72½—74½	57—60	...
130,000	,,	Dec. 11	10	10	Gas and Light and Coke: 10 p.c. Bonds	..	..	...
42,000	—	—	—	7½	Gas and Light and Coke: 7½ p.c. Ilford Deb.	..	..	...
84,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	—	93—98	...
258,740	,,	,,	3½	5⅛	Do. 3½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16⅝	16—17	...
86,600	Stk.	Aug. 23	9	9½	Hornsey 7 p.c.	..	144—149	...
1,976,000	,,	Nov. 15	9	5	Imperial Continental	150—160	143—148	145—147
401,400	,,	Feb. 7	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	72—75*	...
235,342	,,	Aug. 9	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,127,340	,,	Feb. 21	—	5½	Liverpool 5 p.c. Ord.	—	85—89b	...
600,000	,,	Sept. 19	—	7	Liverpool 7 p.c. Pref.	..	105—108b	...
165,736	,,	Feb. 21	7/5/6	8	Maidstone 5 p.c.	—	124—129*	...
63,480	,,	Dec. 28	—	—	Do. 3 p.c. Deb	—	54—59	...
75,000	5	Dec. 13	6	5	Malta & Mediterranean Met. of Melbourne: 4½ p.c. Deb.	4⅛—4⅜	3⅜—3⅝	...
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
341,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'dCon.	..	53—58	54—55½
1,875,892	,,	July 26	4½	4½	Do. 4 p.c. Pref. Stk.	98½—99½	86⅛—87⅛d	...
250,166	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½d	...
529,705	,,	Dec. 28	3½	3½	North Middlesex 10 p.c.	82—83	72—73d	...
15,000	10	Aug. 23	—	11	,, ,, 7 p.c.	—	16½—17½	...
75,940	10	,,	7/14/0	7 7/10	Oriental, Ltd.	14—15	11½—12½	...
300,000	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102	...
138,120	Stk.	Dec. 28	—	7½	Portsea Island, B	—	107—112	...
60,000	50	Sept. 6	13	13	Do. C	128—131	105—110	...
100,000	50	,,	12	12	Primitiva Ord.	118—121	100—105	...
2,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5⅛—6	⅜—⅝	8/—8/3
2,499,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4⅛—5	1 1/16—1 1/8	33/6—34/9
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75	...
600,000	Stk.	Jan. 24	4	4	Do. B. Aires 4 p.c. Deb.	—	54—57	...
220,335	,,	Dec. 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	55½—56½
321,670	,,	,,	4	4	San Paulo: 6 p.c. Pref.	85—87	55—58	...
150,000	10	Oct. 4	6	6	San Paulo: 5 p.c. Deb.	10½—11	5½—6	5 27/32
125,000	50	Jan. 2	5	5	Sheffield A	47—49	37—40	...
270,000	Stk.	Aug. 23	—	5	Do. B	..	100—102s	...
419,968	,,	,,	—	5	Do. C	..	99—101s	...
1,047,000	,,	,,	—	5	Do. C	..	99—101s	...
133,201	Stk.	—	4	6	Shrewsbury 5 p.c.	—	—	...
90,000	10	Oct. 18	9	6	South African	10½—11½	7—9	...
5,609,895	Stk.	Feb. 21	5/9/4	6½	South Met. Ord.	111—113	94—96*	95—96½
102,580	,,	Jan. 10	—	5	Do. Red. Pref.	—	98—100	...
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	72½—74½	57—60	59½
734,000	,,	Sept. 6	—	6½	Do. 6½ p.c. Deb.	..	103—105	104 1/16
92,500	,,	Aug. 23	8½	8½	South Shields Con. Stk.	157—159	136—138d	...
1,087,795	,,	Feb. 21	6	6½	S'th Suburb'n Ord. 5 p.c.	114—116	95—100*	...
368,837	,,	Dec. 28	5	5	Do. 5 p.c. Deb. Stk.	116—118	95—100	...
647,740	,,	Nov. 15	5	5	S'th'mpt'n Ord. 5p.c. max	99—102	86—89	...
121,375	,,	Dec. 28	4	4	Do. 4 p.c. Deb. Stk.	..	74—79	...
250,000	,,	Aug. 23	—	7	Swansea 7 p.c. Pref. Stk.	..	102—104	...
200,000	,,	Dec. 28	—	6½	Do. 6½ p.c. Deb. Stk.	..	102—104	...
120,000	,,	Feb. 21	—	8	Tottenham and District: A 5 p.c.	135—138	119—124*	...
882,275	,,	,,	6	6½	Tottenham and District: B 3½ p.c.	115—117	98—103*	...
181,255	,,	Dec. 13	4	4	Tottenham and District: 4 p.c. Deb.	87—89	77—81	...
258,251	Stk.	Aug. 23	5	5	Tynemouth 5 p.c. max.	108½—109	84—86d	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 12	8½	9	Wandsworth A 5 p.c.	151—156	135—140	...
253,636	,,	,,	6½	7½	Do. B 3½ p.c.	109—114	112—117	...
108,075	,,	,,	5/17/3	6 5/8	Do. C	110—115	98—103	...
240,865	,,	,,	—	6 5/8	Wimbledon 5 p.c. New Ordinary	..	—	...
352,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	107—112	...
98,000	,,	,,	6½	7½	Epsom 5 p.c.	121—126	115—120	...
88,416	,,	Dec. 28	3	3	3 p.c. Deb. Stk.	66—69	56—61	...

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